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"The Hungry Sheep Look Up—"

THE electrical contractors, as much as any section of the industry, are wondering what lies in the future for them, and with the leaders of the Central Board, the Electricity Commission and the I.M.E.A. at their dinner on Tuesday they were justified in expecting to hear something to their advantage—or otherwise.

But there were no fireworks. Although Mr. H. Marryat, the President, relighted the squib of municipal trading, that squib was effectively damped by subsequent speakers and failed to explode.

Mr. Marryat said that for twenty-five years the E.C.A. had fought this bogy, but since 1926 it had been carefully stowed away in a box with the lid tightly shut while terms of agreement between the various sections of the industry were being hammered out by Committee D.

A Fair Trading Policy had been produced with the assent of all parties save one—and that, from the contractors' point of view, probably the most important one. The Incorporated Municipal Electrical Association had not yet subscribed to it.

He pointed out that there *had* been some progress towards agreement, and with somewhat qualified optimism expressed the opinion that the Fair Trading Policy would be consummated some day; *perhaps* within the lifetime of some of the youngest men present at the dinner.

Sir Archibald Page, the Chairman of the Central Board, had previously paid a tribute to the important work of the contractor and, subsequently, Sir John Brooke added the Commissioners' appreciation of this work. Their speeches, however, gave more pleasure and amusement than guidance, and we waited rather anxiously for Mr. Hoadley.

But the President of the I.M.E.A. declined to pick up the gauntlet thrown down by Mr. Marryat. He spoke rather as the President of the first National Electrical Convention. He confessed that in his earlier days he had held strong views about contractors, but time had mellowed these views and now he was able to live peaceably with them. He visualised the I.M.E.A. and E.C.A. walking hand in hand together along a not very clearly defined path.

In fact, it was abundantly evident from the speeches that although the industry will go on and on, nobody is quite certain of the direction in which it is heading. As we have often said in recent months, the industry is becoming impatient for a lead.

Finally, then, the impression left upon our minds is that we are still waiting for leaders to develop an acceptable and workable policy for the future of the industry.

"The hungry sheep look up and are not fed."

Much-needed Electrification

IT must be more than twenty years ago that the need for electrifying the railways running out to north and north-east London from Liverpool Street was first under discussion. At meetings of the Great Eastern Railway, as it was then called, Lord Claud Hamilton said that they were carefully watching what other systems were doing, and were waiting for the results of the electrification of the L.B. & S.C. Railway on the overhead system, under Sir Philip Dawson, before deciding upon third-rail or overhead collection. The excellent suburban traffic results on that railway, and the big extensions of recent years, have not been followed by a hasty decision. Later it was stated that the great improvements that were taking place in steam locomotive design made it undesirable to act in a hurry electrically. Frequently it has been stated that a complete electrical scheme for Liverpool Street lines, and to serve increasingly congested areas, was prepared many years ago and lies in the company's archives; the cost was put at ten millions sterling at the time. There was also a proposal for an electric tube line from the City to the north-eastern areas; the G.E.R. naturally opposed it, and much evidence both for and against it lies recorded in

the ELECTRICAL REVIEW. On various grounds it was rejected, and trams and buses were left to do the work. The cost of electrifying the G.E.R. and of constructing the new tube would be more than double to-day, and still, in 1935, the public have to put up with overcrowding, breakdowns, and all sorts of inconvenience which electrical working would have prevented. Occasionally questions are asked in Parliament; sometimes hopes are raised, but generally little satisfaction is to be derived from the replies. The pressing need for change has been the subject of full publicity in the Press recently, and there has been plain speaking by Sir Philip Dawson, but the chairman of the railway company holds out little hope of early electrification unless with the aid of "public funds."

Good Work at Poplar

IT is not very often that cooking demonstrations attract audiences of between 1,000 and 1,500 people, but that is what happened at Poplar last week. For this credit is due to the efforts of the borough electrical engineer, Mr. R. Illingworth, and the General Electric Co., Ltd.—to the former for his enterprise in introducing a 1d. a unit all-in rate, including the hire of a cooker and kettle; and the latter for staging some very attractive displays. Every day last week the magnificent municipal baths, converted into a large public hall during the winter months, were crowded—people were actually turned away—and the results have been very satisfactory. It was hoped to dispose of a thousand cookers during the week—quite apart from the after-effects which experience has shown to follow such demonstrations. While congratulating Poplar we must not forget that it was Mr. J. W. J. Townley at West Ham who first introduced a penny all-in rate some time ago. These examples show that this most effective method of building up a cooking load is a feasible and paying one, and we commend it to other undertakings who wish to get the working classes to use electricity.

Fabricated Steel Buildings

DESPITE the success that has attended the use of electric welding in the manufacture of the frames of electrical machines and the rapid extension of the method in shipyards recently, we are some way behind many other countries in its application to buildings. This must be ascribed to the tardiness of the official recognition accorded to its reliability, but with the example before us of the new Bank of England (believed to be the first large building in the L.C.C. area with a fabricated frame throughout) we should begin to make up leeway. The electrical industry can provide the welding plant, the electrodes, and the technical experience; all it needs is the opportunity to give them full scope. In the course of a lecture to the Institution of Junior Enginers this session Mr. C. H. G. Aston showed that the fabrication of bridges in Sweden had saved nearly one-fourth of the metal otherwise required. Continental experience indicates savings of up to 15 per cent. in the cost of the framework of large buildings. The value, too, of the increase in human efficiency due to the elimination of the pneumatic hammer should be appreciable.

Price and Consumption

SIR ARTHUR PREECE'S letter to *The Times*, on which we commented last week, has been followed by one from Mr. W. B. Woodhouse, who emphasises that the official figures quoted are average prices for average consumptions, and that even 1s. per kWh may be not unreasonably charged to those who do not avail themselves of opportunities to use more electricity. For example, in the Norwich demonstration area the average energy sold in 1933-34 for domestic or shop premises connected was 362 kWh, and the average price was 2.26d.; under the Bedford scheme the corresponding figures were 560 kWh and 1.64d. The Bedford scheme, with an overall revenue of 1.04d. per kWh sold, has the advantage that more than half the output is used for motive power at an average rate of 0.52d. per kWh, indicating the value of such loads in rural areas in contributing towards development and standing charges.

The Gas Unit

THE gas committee of Rotherham Corporation wishes to adopt a "gas unit" of 4,000 B.th.u., which is equal to one twenty-fifth of a therm or 8 cu. ft., assuming a calorific value of 500 B.th.u. per cu. ft. The interest of this proposal to the electrical industry is the suggestion it conveys that 4,000 B.th.u. supplied as gas does the same work as 3,412 B.th.u in 1 kWh. The margin allowed between the two looks like a specious attempt, by making a small concession, to meet the general opinion that there is some difference in favour of electricity. In practice 1 kWh is approximately equivalent to one-tenth of a therm under average domestic conditions. The use of the term "gas unit" is likely to leave an impression in the minds of the public that to give a value in use equivalent to that of gas at 10d. per therm, electricity should be sold at 0.4d. per kWh, whereas it would still have something in hand at double that price.

Securing Sound Installations

IN a number of ways the British Dominions are ahead of the Mother Country. For instance, Victoria, Australia, has just appointed an Approvals Board, whose *cachet* will be necessary before electrical appliances can be sold in the State. The Province of Ontario already has a similar system in operation. Although opponents of such schemes will maintain that they increase the cost of apparatus, we think that the majority of electrical men will agree that ultimately they will prove of great benefit to the public and to those who serve them in an honest manner. Victoria is also introducing the compulsory registration of electrical contractors, which has been one of the aims of the E.C.A. in this country for many years. Good workmanship and good materials are essential in our industry, for slackness in either direction invariably means future trouble and dissatisfaction.

Revival in Birmingham

RECENT conversations with some of the engineers of the Birmingham Electric Supply Department have confirmed our view that industry in that city is looking up. During last year forty-three new concerns were connected to the e.h.p. system, representing 15,500 h.p. In addition to this, twenty-nine firms increased their installations to the extent of 24,000 h.p., and one factory which was previously run on internally generated power now takes 12,000 kW from the Department. The reorganisation of another factory led to a demand for a further 1,750 h.p. Altogether last year the Department sold 345 million kWh from its h.v. system; this was 54 millions in excess of the 1933 total. Parallel with this increased activity on the industrial side there was continued expansion in the domestic field, so that the figures for the year ending in March should prove very satisfactory.

The Heavy-Oil Engine

THAT valuable source of information on the operation of the modern form of internal-combustion engine—the annual report of the Diesel Engine Users' Association (which we review on another page) lends little support to the contentions of pessimists regarding the future of this type of prime-mover or of the activities of the Association itself. The increase in the output of electricity generated by Diesel sets covered by the report is paralleled by information from manufacturers regarding the number of contracts in hand—mainly for service overseas. Outside the present scope of the Association are other promising developments of the Diesel-electric system, such as shunting and the propulsion of small vessels.

Salvage and Refuse Disposal. By Thomas H. Hall

Generating electricity from rubbish at Birmingham

BIRMINGHAM'S refuse disposal system, reorganised over a period of fifteen years at a cost of £556,440, and now among the most efficient in existence, provides many interesting applications of electricity. A fleet of 139 electric vehicles, the largest operated by any municipality in the country, has almost entirely replaced the horse-drawn carts; it collects 88 per cent. of the total refuse. Details regarding the operation of these vehicles were given in the ELECTRICAL REVIEW of August 19th, 1932.

Five separate works are in operation, the £193,770 Montague Street Works, situated near the city centre, being the most important. The Department's offices and laboratory, workshops and main stores, are situated here. These works serve an area of 4,678 acres, and are capable of relieving any of the four other works. The plant is designed to deal with 350 tons of refuse daily, and copes with 75,000 tons per annum, collected from 61,000 premises with a 250,000 population.

Above: The 30-ton hoppers and dust-collecting equipment. Below: The incineration plant

Five 30-ton hoppers are situated along one side of the refuse reception house, each provided with an overhead sheet-steel canopy connected to a 40-h.p. exhaust fan with a capacity of 40,750 cu. ft. per min., for delivering the air into a chamber, where heavy particles of dust are deposited. Textile filtering tubes collect the finer dust and allow the cleaned air to escape. Feeding gear delivers the refuse at a regular and controlled rate to the screening plant without manual assistance, each feeder being separately driven from an electric motor through enclosed worm reduction gears and a train of spur gearing. The feeders are enclosed in a separate room to confine dust caused during tipping.

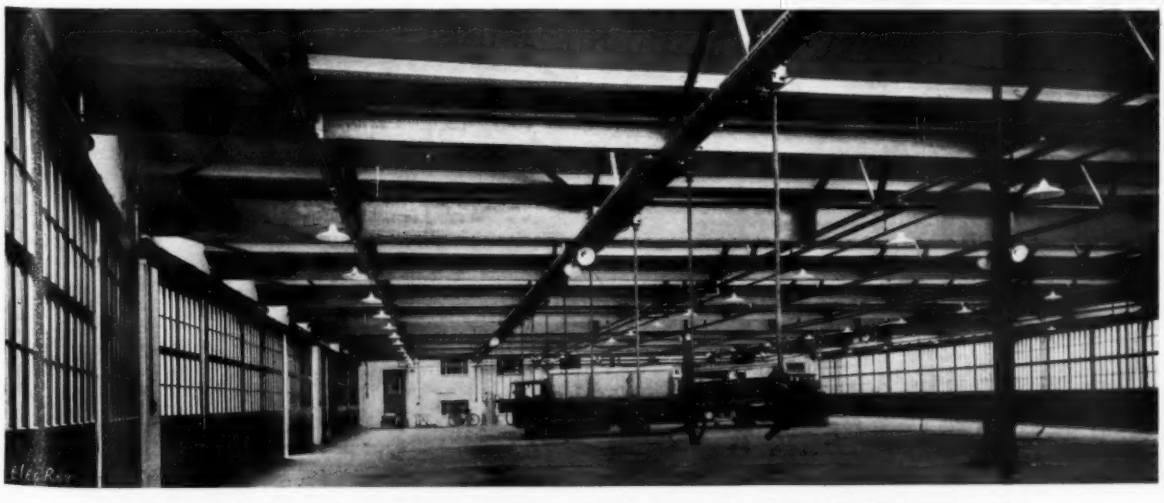
Five band conveyors, travelling through galleries, convey the crude refuse from the feeders to five 6-ft. diameter horizontal screens, with internal helix and meshplates (⅜ in. diameter perforations) for dust extraction. A double coned outer casing collects the dust to a central point for delivery to barges or to the dust conveyor situated below. Idlers with renewable solid rubber tyres and adjustable roller bearings carry the weight of each screen, machined cast-iron rings being bolted to the casing to form the rolling paths; drive is by spur ring and pinion. For the separate ventilating plant in the screening room, a 40-h.p. motor, driving a fan with a capacity of 32,000 cu. ft. per minute, is employed with a filter. Mild-steel ducts with damper regulation are connected to all points where dust may arise on screens, picking belts and dust conveyors.

Recovering and Baling Tins

Magnetic separators are fitted to each screen, and the recovered tins are taken by belt conveyors to two "Rosedowns" hydraulic baling presses. A magnetic pulley, an arrangement of chutes, and an electric blower ensure reasonable cleanliness of recovered tins. The baling presses, each capable of producing upwards of twenty bales per hour, are operated from one point by a combined balancing piston valve, the 60-lb. bales (18 by 12 by 6 in.) being automatically pressed and discharged.

Five picking belts receive the tailings from the screens and deliver them to a common collecting conveyor beneath the screen room, where space is provided for sorting, baling, and temporary storage of salvaged materials. The refuse conveyors are 40-in. rubber-covered belts carried on machined cast-iron idlers, running on hollow lubricating spindles. A two-way chute directs the refuse to conveyors feeding either units 1 and 2, or 3 and 4, and three mechanically driven trippers with forward and reverse gear run the whole length of the hoppers over the units, permitting effective distribution of the tailings. Ventilation hoods above each tripper are connected by ducting to the suction side of the forced-draught fans. Two belts convey dust from the screens, and a two-way chute directs it to the cinder recovery plant at one end of the screen room, or discharges it into barges.

The incineration plant consists of four 4-cell units. Air for combustion is blown into the independent ashpits under pressure of 2 in. w.g., forced-draught fans, each direct coupled to a 15-h.p. motor. Three longitudinal double-drum Babcock and Wilcox boilers with heating surfaces of 4,020, 1,966 and 1,966 sq. ft., and two Lancashire boilers with heating surfaces



A view of the garage for the electric collection vehicles, showing overhead charging arrangements

of 1,100 sq. ft., are fitted. Steam conditions are 160 lb. per sq. in. and 480 deg. F. The boilers on Nos. 2 and 4 units are fitted with "Babcock Clyde" single nozzle soot blowers working with superheated steam.

Organic Waste

Organic waste is dealt with by the Iwel-Laabs dry rendering process. It is brought in vehicles up an inclined roadway to the top floor of the plant where the offal (meat) is cut and cleaned of manurial content. After draining it is charged into two melters on the floor beneath, where live steam in a jacket converts any moisture in the raw material into steam, and internal pressure, built up by closing a valve, in conjunction with the agitating effects of revolving beater arms, disintegrates the material and releases any fat. Evacuation of the steam by a vacuum-pump leaves a mixture of liquid fat and dry solid product which, with the agitating gear in reverse, is delivered by blades into a receiving and percolating tank. The liquid fat drains to settling tanks prior to refining and blending for sale. The solid product is charged into removable baskets and loaded into the steam turbine centrifugal fat extractor for a final removal of fat, after which it is fed over an electro-magnetic separator for iron extraction. Screening and automatic sacking complete the process, and a monorail overhead runway and electric hoist convey the products to the store room.

The vegetable plant subjects the raw material, after being reduced to a uniform mass, to the heavy pressure of revolving presses which removes practically all water, final pressure taking place on a felt surface for absorption. About one quarter of the original weight of material goes to the dryers for finishing, where final compounding of the dried vegetable matter results in "Veg-U-Mus" fertiliser. Ventilation in this building is by ducting and a centrifugal fan coupled to a 15-h.p. motor.

Control Gear

The electric motors throughout the works are of the totally enclosed type manufactured by the Electric Construction Co., Ltd., and the General Electric Co., Ltd., and are controlled by push-button contactor-magnet type starters of the d.c. non-reversing pattern. Each starter for the motors driving the feeders, screens and conveyors of crude refuse, refuse distribution, dust and tins, is fitted with sequence interlock, with which are combined isolating contacts enabling any motor to be cut out of sequence and run independently for testing purposes. Interlocking is so arranged that one or more screening units may be in use at any one time, indicator lamps in the screen room for the five motors driving the feeders giving immediate indication of any involuntary stoppage. Push-buttons at various points enable the whole conveying plant to be shut down in an emergency.

Power wiring to the starters is carried out in tough rubber-covered cable cleated to timber battens, and from the starters to the motors in conduit. Cast-iron distribution and junction boxes are used.

Illumination is by floodlighting with "Simplex" deep reflector lanterns on adjustable brackets. The electrical vehicle garage and workshop, housing sixty-four vehicles, is fitted with a 5-ton overhead travelling crane and inspection pits. The charging plugs are attached to flexible, overhead cables, connected to separate junction boxes with cord grips having bell-mouth attachments. A workmen's canteen includes kitchens and sculleries equipped with all-electric cooking equipment and large cabinet refrigerator.

The Power House

Two 370-h.p. 425-r.p.m. Belliss and Morcom two-crank compound condensing engines drive G.E.C. 250-kW, 470-V compound-wound generators. The motors for the circulating and condensate pumps and oil separator pump are controlled by automatic starters.

Three G.E.C. five-wire balancers, each consisting of two-shunt-wound machines, capable of dealing with an out-of-balance current of 120 A, are provided for battery charging.

The main switchboard is arranged in two tiers. Instruments include a feed-water meter, steam-flow indicators, temperature indicators, and a multi-point draught gauge. Messrs. Heenan & Froude, Ltd., supplied the refuse disposal plant, including screening plant, incineration plant and buildings; the United Electrical Co. (Coolex), Ltd., generating plant, electric vehicle charging plant and switchboards; Thomas Glover and Simplex Electric Co., Ltd., the lighting installation; the Rapid Magnetting Machine Co., Ltd., magnetic separators; the Record Electrical Co., Ltd., circuit-breakers and instruments; the Vaughan Crane Co., Ltd., overhead cranes, runway and electric hoist; and Messrs. T. J. Priestman, the lamp standards.

Mr. J. H. Codling, A.M.I.Mech.E., M.Inst.P.C., is general manager of the Department and Mr. C. L. O'Shaughnessy, D.S.O., M.Inst.P.C., is electrical engineer.

Thermostatic Cooker Control. By J. R. Hickmott

Is a thermometer sufficient?

IT is controversial whether electric cookers should have thermostatic control, and actually very few cookers have been so fitted. In order to obtain the views of consumers on this matter I recently interviewed several experienced users, and there was a definite majority in favour of the adoption of a thermostatic control unit as a standard fitting. The reason given in each case—and I can confirm it as a fact—was that very often when the switch was turned to "low" the temperature began to drop. This was no doubt due to the fact that the switch was operated before the food had been properly heated through, but the point still remains in favour of thermostatic control. A few consumers could give no reason for the adoption of a thermostat, and I believe that the control dial was really the attraction.

The general opinion of those engaged in the industry is, I believe, that the three-heat switch provides a sufficiently close control to make the application of the thermostat unnecessary. There is little doubt that this is convincing, but it is biased because satisfactory results can be obtained without a thermostat. It is also biased from the technical point of view, because the control must be fairly constant. The average consumer is still a little afraid of electricity for cooking purposes, and usually succeeds in burning a few things before becoming fully acquainted with its proper use. In order to remove this fear it is necessary to adopt every convenience that tends to make the use of a cooker foolproof and absolutely safe.

Inconvenient Switches and Thermometers

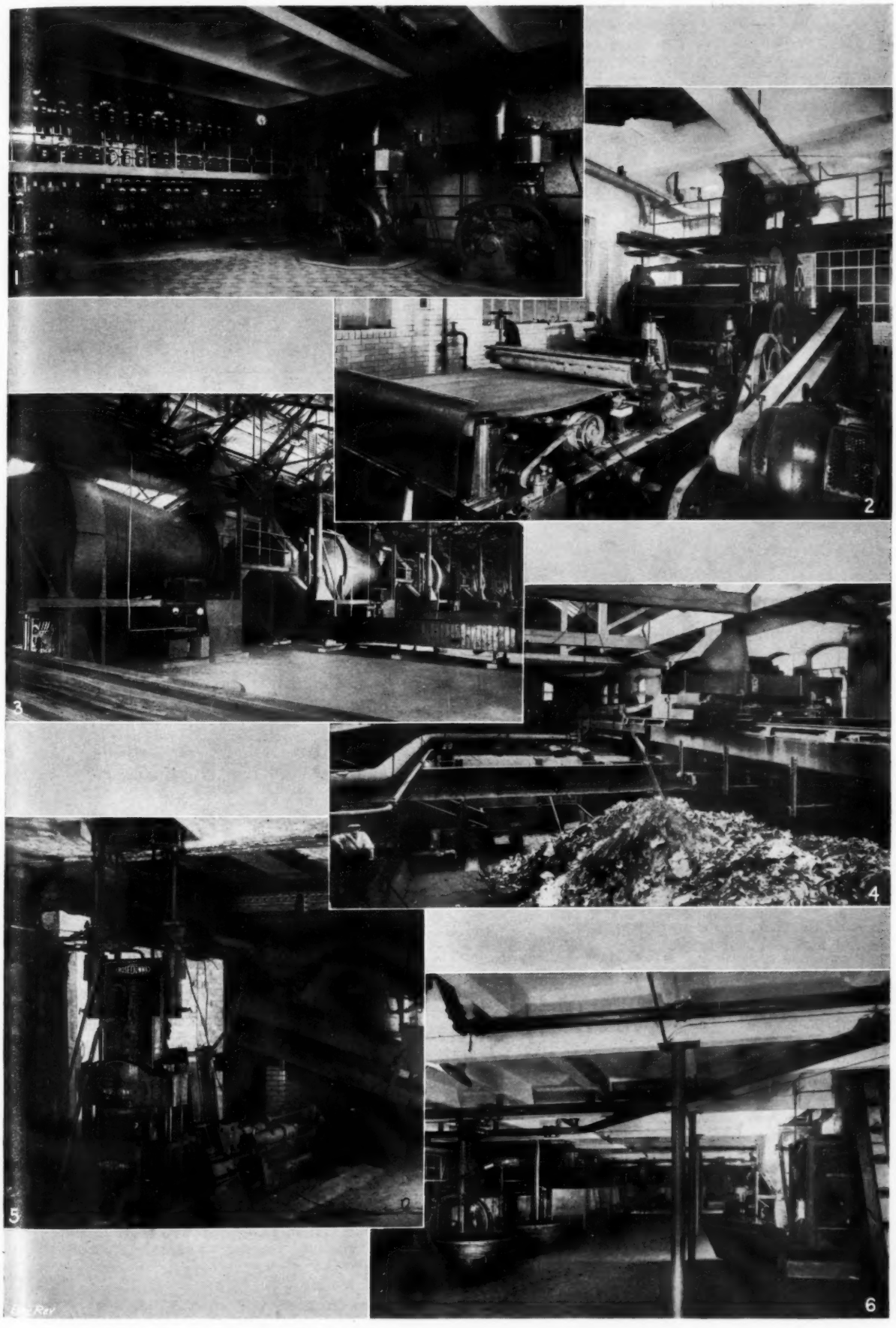
An objection raised to thermostatic control is that it adds a complication, while the existing switches are simple and precise in operation. This would be true if the switches were fitted at an angle to the cooker so that it would be possible to see at a glance the position of each switch.

The thermometer, in my opinion, is a definite source of inconvenience. On some cookers it is almost impossible for a consumer with weak eyesight to see it. The point that appears to have been missed is that many consumers have to wear glasses for reading, while under ordinary circumstances they require none. It is unlikely that such a consumer would carry spectacles about with her while cooking, and this means that a journey must be made to another room and perhaps the glasses will have to be put on with floury hands. Much of this would be eliminated if thermostatic control were fitted to cookers.

Apart from all other considerations there is no doubt that many consumers would like thermostatic control even if the result of the addition was only to do away with the thermometer. To my mind this reason alone is sufficient to warrant its adoption. It would be an additional refinement, and many consumers would undoubtedly benefit by its use. The cost of fitting electric cookers with thermostats would not be excessive, and the addition to the price would be accepted willingly by many supply authorities if they realised its influence on cooker sales.

Competition to-day is greater than it has ever been, and it is up to the manufacturers to give salesmen the answer to every point raised by competitors with regard to their products. Consumers often tell me that they had been informed by gas company salesmen that it is impossible to fit thermostatic control to electric cookers. I feel confident that this information is given in all good faith, and is entirely due to the fact that those few electric cookers which have combined thermostatic and three-heat control are so few, and probably backed by such little advertising, that their existence is unknown.

If it is felt that thermostatic control is not required in every case, why not merely make provision for its later application? It would then be up to the consumer to make the choice. I have always felt that the consumer should, within reason, be allowed to make the final decision in all controversial matters. Every salesman should be able to give advice to a consumer, but it is unfair to expect a salesman to give advice against little things which he knows would be beneficial.



Refuse Disposal and Salvage at Birmingham

1. The power plant and switchboard. 2. Vegetable refuse treatment plant. 3. Screen rooms. 4. Charging floor and refuse distribution. 5. Tin-baling press. 6. Plant for treating organic refuse

Natal University College. By Douglas Spencer

INFLUENCED by the requirements of the Rand, 417 miles away, Durban has great possibilities as a manufacturing centre, and such is its layout that this can be achieved without depreciation of its amenities as the fashionable seaside resort of Johannesburg and its suburbs which lie within a radius of 420 miles.

It was natural, therefore, that following the trend of industrial development the Natal section of the University of South Africa, which embraces also Grey University College, Bloemfontein; Huguenot University College, Wellington; Potchefstroom University College and Rhodes University College, Grahamstown, should extend its activities from Pietermaritzburg, Natal's capital, to Durban, its port and largest town. In the former, University work began in 1910; in the latter, where training in engineering, commerce and fine arts is carried on, in 1922. In 1934 ninety-two students were undergoing training in engineering.

The electrical side of engineering is prominent, as the Durban undertaking alone sells about 115 million kWh a year. In view of the gradients on the Natal Railway electric traction has been to the fore for a long period, energy being taken from the Electricity Commission's stations at Colenso (60,000 kW) and Durban (48,000 kW).

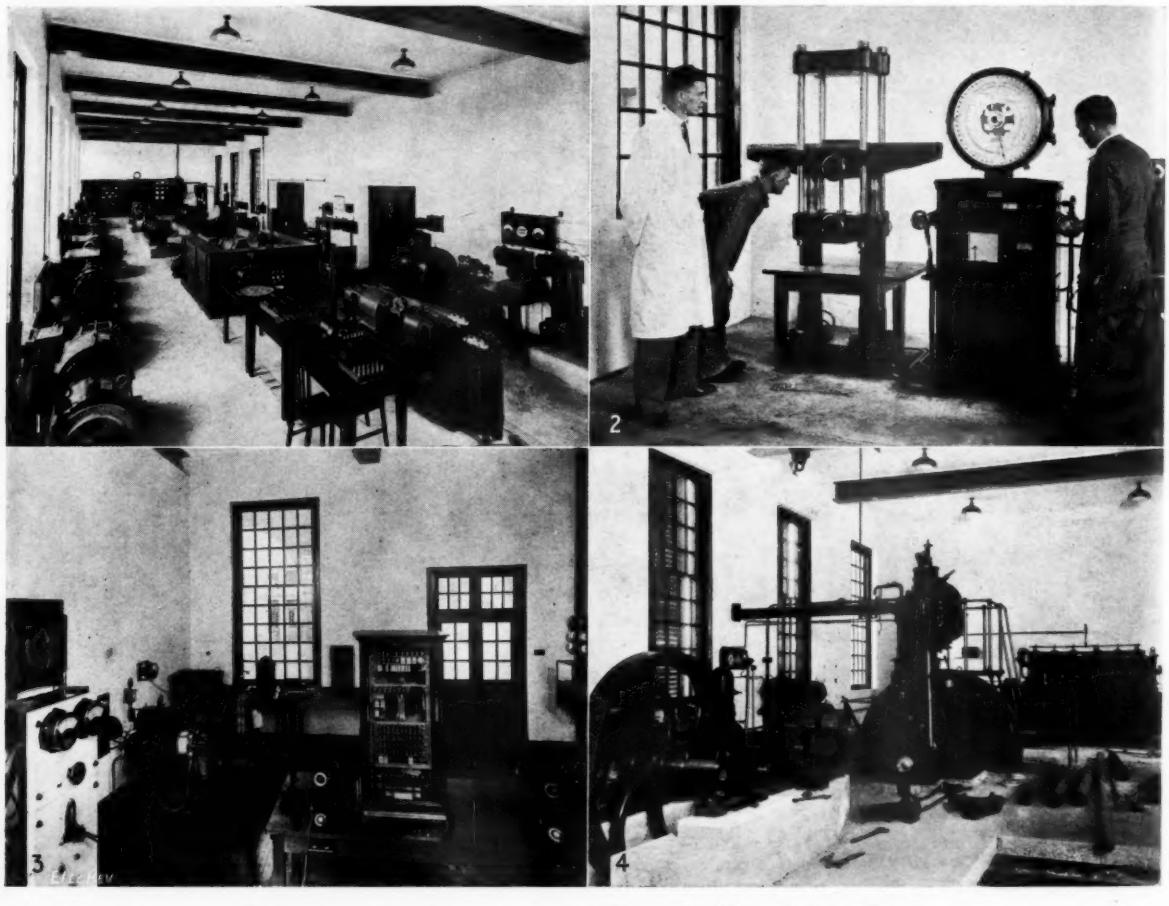
The Howard Memorial College, which was erected to the memory of the son of Mr. T. B. Davis, who was killed in the Great War, occupies a magnificent site of fifty acres overlooking the town and bay at a height of 460 ft. above sea level.

The main electrical laboratory is 95 ft. long and 25 ft. wide. Machines are arranged in four parallel lines, and the suspension of tackle for handling heavy items is facilitated by the girders supporting the floor above being left exposed. Eighteen panels with two- and three-pole switches are arranged at convenient points, the terminals being connected to plug-in sockets on the switchboard. Jumpers are used to connect these sockets with power sockets to supply required voltages to the panel terminals.

Along the left wall in the electrical communications laboratory, illustrated on this page, can be seen a 30-kW Poulsen arc generator. In front of the window stands a Creed teleprinter, while in the right-hand corner is the automatic telephone exchange which serves the building. On the table in the middle is a five-line demonstration model automatic telephone exchange. Other rooms are devoted to radio, batteries, workshop, &c., and they cover altogether 5,000 sq. ft. Details of the equipment, most of which came from Britain, are contained in a booklet prepared by Professors H. Clark and J. H. Neal.

It is not an easy matter to familiarise students with all the devices which are constantly being put on the market. Nor are the students themselves, except in a few cases, able to avail themselves of visits to manufacturing works, as is the case with students in Britain. It is to be hoped, therefore, that manufacturers at home will help by keeping them in the closest touch with the latest developments and inventions and the means of employing electricity and power in general.

An idea of what some of the College's present requirements are is conveyed by a letter which I recently received from Professor Clark. In this the Professor says: "Sample cases illustrating cable and lamp manufactures and samples of carbon brushes, supply meters, switchgear, protective relays, telephone relays and parts would be most welcome." It is likely that in view of the cheapness of power in many parts of the Union of South Africa (eight kWh a penny at the bus-bars of one of the large stations) careful investigations will be made into the advisability of establishing further electro-chemical and electro-metallurgical industries.



Laboratory Equipment at the Howard Memorial College.

1. The main electrical laboratory. 2. Students using a 50-ton testing machine. 3. A corner of the electrical communications room. 4. Various motive plant

International Conference on Distribution

The International Conference on Large Electricity Distribution Systems is to be held in Paris from June 6th to 15th next, under the auspices of the International Electrotechnical Commission. It is two years since a similar conference was held, when 131 papers were presented. Already for the 1935 conference fifty special papers have been promised from Germany, Great Britain, the United States, France, Italy, and Switzerland. Full particulars may be obtained from the Secretariat General, 54, Avenue Marceau, Paris. This event is to be followed by a full session in Brussels of the International Electrotechnical Commission lasting from June 18th to 27th.

Lifting-magnet Control. By W. A. Barson

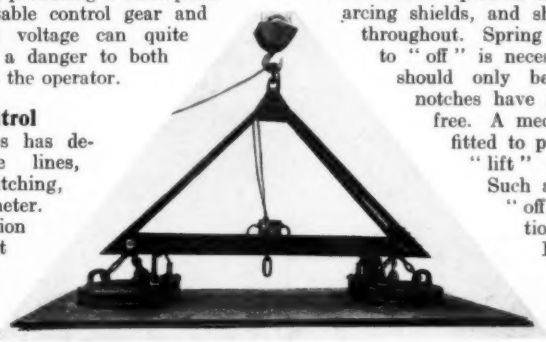
A survey of some of the leading systems

AS larger electric lifting magnets have become necessary to cope with the demands of increased production the satisfactory control of the heavier excitation currents has become increasingly difficult owing to the very high inductance of the magnet-coil circuit. This feature of self-inductance is the whole problem of electric lifting-magnet control.

Three fundamental operations are necessary for lifting-magnet control. These are: first, to supply the full excitation current necessary for lifting the load; secondly, to break the circuit for discharging; and, finally, to supply a small reversed excitation current momentarily to complete the demagnetisation. This small reversed current breaks down the residual magnetism which tends to retard prompt and complete discharge after the magnetising current is cut off.

Supplying the excitation current presents no difficulty, as direct switching on to the line is permissible, but in breaking the circuit for discharge the high inductance of the magnet coil calls for special consideration. When the circuit is opened the energy due to the collapsing magnetic field produces a very high e.m.f., which must be dissipated or otherwise prevented from reaching a dangerously high value.

The difficulty is aggravated by the application of the reversed current for demagnetising; if this is applied before the magnetic field has had time to die down the result is almost instantaneous collapse of the field, producing a correspondingly high e.m.f. With unsuitable control gear and careless operation this induced voltage can quite easily become so high as to be a danger to both the magnet equipment and also to the operator.



Witton-Kramer 43-in. lifting magnets handling ¾-in. steel plates

Three Methods of Control

The control of lifting magnets has developed along three separate lines, namely, direct contactor switching, series resistance, and potentiometer. Considerable differences of opinion exist as to their merits, but there are many satisfactory installations of each type. A simple and straightforward system of contactor control for lifting magnets, which originated in the U.S.A., is now probably the most popular method for ordinary lifting service. Fig. 1 shows a diagram of the main circuit connections made by the contactor controller. In the "lift" position the magnet is connected across the mains, while in the "off" position the circuit is broken and a discharge resistance is connected across the magnet. In the "drop," or demagnetising, position the current is reversed and a series resistance is inserted. The master switch takes only the pilot current for energising the contactor-operating coils, while the contactor panel is so arranged that the discharge resistance is connected simultaneously with the breaking of the circuit, so that no open circuit occurs in the magnet coil. The master switch is fitted with spring return from the "drop" position to "off," as the "drop" position is only for momentary use and must not be left on. In discharging a load a pause should be made in the "off" position to allow the field to die down before moving over to "drop."

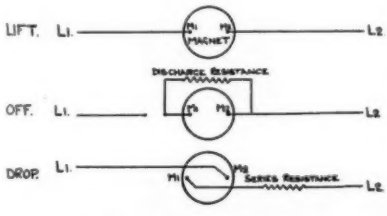


Fig. 1.—Main circuit connections made by contactor control

Prior to the comparatively recent popularisation of contactor control gear series-resistance control for lifting magnets found almost universal favour, both in this country and on the Continent. In this system the energising current is applied through a drum-type controller with steps of series resistance in a similar manner to that of starting up a d.c. motor. Fig. 2 shows the connections made on each step.

It will be seen that in the "off" position a discharge resistance is connected across the magnet coil. On the first notch series resistance is in circuit, while the discharge resistance still remains connected to the magnet. On the second notch the discharge resistance is disconnected and notches 3, 4, 5 and 6 step-down the series resistance and apply full-load current to the magnet. Demagnetising for the "drop" position shows the current reversed, with both series and discharge resistances connected.

When switching off and demagnetising each step reduces the current flowing through the magnet until, on the step before actually breaking the circuit, the discharge resistance is connected so that in the "off" position the magnet coil is still a complete circuit. A slight pause is then made to allow the original field to die away before reversing the current.

Mr. W. A. Barson has had considerable experience of industrial lifting installations and is the author of "Electric Overhead Travelling Crane Design" (Crosby Lockwood)

The controller for this equipment is of the drum type, crank-handle operated and with blow-out coil and heavy arcing shields, and should be generously proportioned throughout. Spring return from the "drop" position to "off" is necessary, as the "drop" position should only be used momentarily. The lift notches have no spring return, but are quite free. A mechanical throw-over catch is often fitted to prevent switching right over from "lift" to "drop" in one movement. Such a stop ensures some pause in the "off" position, and so offers protection against misuse.

Potentiometer control is simple and nearly foolproof. For the system developed by Messrs. Allen West & Co., Ltd., it is claimed that however quickly the controller is operated between the "lift," "off" and "drop" positions the induced e.m.f. can never rise higher than the supply voltage. The controller for this equipment is of the drum type with ordinary crank handle.

Connections made on the notches of the controller are shown in fig. 3. In the "off" position the magnet coil is short-circuited and connected to one end of a resistance, the whole being disconnected from the mains. On the first notch the mains are connected to each end of the resistance, but the magnet winding still remains short-circuited, as in the "off" position. On the second notch one end of the magnet coil is moved across a part of the resistance, so that a small current is applied. On the succeeding notches the magnet is connected across more and more of the resistance until on the sixth notch it is right across the mains. In switching off the reverse process functions. No current passes through the magnet coil on the first notch, and the same condition relative to the magnet is maintained as in the "off" position. For the demagnetising position the mains are again connected on to the resistance and the magnet coil is reversed across a small portion of the resistance.

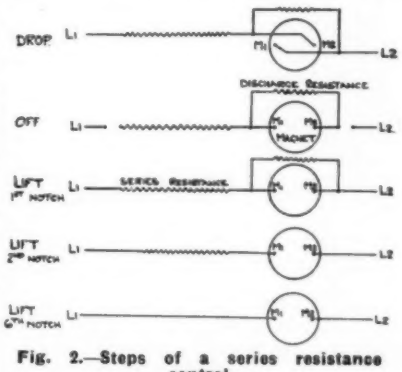


Fig. 2.—Steps of a series resistance control

Reduced Hold-on Current

The current required to hold the load once it is lifted is much less than that required to fasten on to and lift the

load in the first place. The safe reduction in current after lifting the load depends entirely on the nature of the load and the contact it makes with the magnet poles, but even for handling pig iron and scrap steel (which give uneven and poor pole contact) the hold-on current can generally be reduced to two-thirds or a half of the full lifting current. In addition to the saving in energy consumption a further feature is that with the considerably reduced hold-on current, the heat generated in the magnet coil is much less.

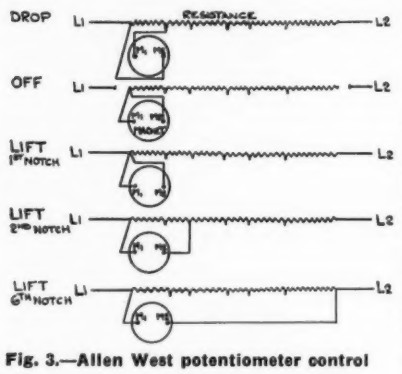


Fig. 3.—Allen West potentiometer control

As the resistance of the coil increases with a rise in temperature the excitation current becomes less; since the lifting capacity varies approximately as the square of the excitation current it is greatly affected by the temperature of the coil.

A system of control has been evolved by the Igranic Electric Co., Ltd., by which the reduced hold-on current is automatically applied after a predetermined time for lifting under full-load current. The equipment consists of a relay panel with contactor for short-circuiting the relay resistance when the current is switched on, and a switch controlled by an adjustable dashpot for opening the contactor and inserting the resistance after a predetermined time.

The time-lag dashpot switch which inserts the series resistance is adjustable, and for general service a setting of from ten to fifteen seconds is generally found satisfactory. The following summary of the results of two tests, each of four days' duration, gives the actual performances of a 52-in. diameter circular lifting magnet, first with ordinary contactor control and secondly with contactor control with Igranic relay panel added. This test was taken under working conditions, handling general steel scrap and pig iron, and the figures show that by reducing the hold-on current the magnet coil was kept cooler, consequently extra tonnage was handled.

	Ordinary control.	With relay panel.
Magnet current (cold)	53 A.	47 A.
„ „ (hot)	31 A.	41 A.
Average load per lift	0.285 tons	0.35 tons

The average increase per lift with relay panel was 23 per cent. The relay was set to reduce the current to 30 A ten seconds after switching on. The difference in the full magnet current (cold) was due to the initial temperature being higher in the second case. The higher excitation current of the hot magnet with the relay panel control is, of course, the secret of the increased load.

The "Phœnix" contactor gear (Messrs. Appleby & Co., Ltd.) is automatic in operation in that, after the magnet current is switched on, the operator can put the master switch to "off" and "drop" as soon and as quickly as he likes without any possibility of detrimental effects, the main current being inoperative until the magnetising current in the coil has fallen to a predetermined figure, usually about ten per cent. of full load. The first step of the master switch inserts a series resistance in the magnet circuit which is immediately short-circuited, leaving the magnet connected across the mains. In switching off, the series resistance is reinserted and the magnet coil is then short-circuited. The circuit is held locked by a relay which is only released when the magnetising current has fallen to the predetermined value. Sequence interlocks complete the cycle of working automatically.

The battery of two 43 in. diameter Witton-Kramer circular magnets handling ⅜ in. thick steel plates 19 ft. long by 7 ft. wide illustrated is arranged to lift a full load of four plates and to drop them off one at a time beside various machines.

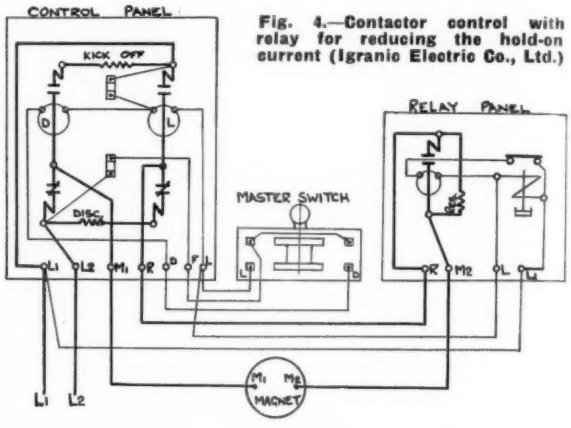


Fig. 4.—Contactor control with relay for reducing the hold-on current (Igranic Electric Co., Ltd.)

This is effected by reducing the magnetic field until the penetration of the flux is not sufficient to hold the bottom plate but is still strong enough to hold the upper plate or plates. The controller is arranged with special notches for dropping each plate in turn, and the excitation current is reduced at each notch by inserting series resistances, the values of which are found by trial. The current for dropping the bottom plates cannot be reversed, but as this method is generally used for fairly big plates the sticking effect of the residual magnetism is overcome by the weight of the plates.

An equipment of this type is, of course, suitable only for the particular size and number of plates for which the control gear has been arranged.

The James Watt Memorial Institute

THE James Watt Memorial Institute, which was opened by Mr. Alan Chorlton, M.P., in May, 1933, is well into the programme of its second session, which comprises 145 lectures and over 100 committee meetings between September and April. The participating organisations include the Institution of Electrical Engineers and students; the Institution of Welding Engineers; the Electrodepositors' Technical Society; the Junior Institution of Engineers; and many other bodies, the secretaries of which, in conjunction with the trustees, form the Management Committee. The subscriptions from these institutions, plus the income from the James Watt Memorial Trust Fund, provide the means to run the Institute. In addition various gifts have been received, as visitors to the Institute will observe, namely, relics of James Watt and furniture for the library given by Mr. Boultbee Brooks. The General Electric Co., Ltd., Witton, has given £100; and other donations have been received, examples of generosity which it is hoped will be followed by other industrial concerns in the district, so that the genius of James Watt may perpetually be present in the minds of the engineers of Birmingham. As funds permit books of reference are added to the library. The honorary secretary of the Management Committee is Mr. W. C. Freeman, of the Institution of Welding Engineers. The trustees of the Fund are Sir Harry Barling, Bt., C.B., chairman, Sir Herbert Austin, K.B.E., M.I.M.E., Mr. W. B. Challen, M.I.M.E., hon. sec., Mr. R. A. Chattock, M.I.E.E., Major S. J. Thompson, D.S.O., M.I.M.E., and Mr. J. D. Watson, vice-president of the Institution of Civil Engineers.

A lecture in progress at the Institute

Electrode Heater Operation

Methods of meeting increased conductivity with rising temperature

DIFFICULTIES have been encountered in the design of commercial electrode heaters for central heating on account of the increase in conductivity of water with increasing temperature. Fig. 1 shows that the increase in the conductivity of a sample taken from a certain municipal water system is approximately 2½ times within a range of 160 deg. and 260 deg. F. This means that if the loading of an uncontrolled electrode heater is 1,000 kW at 160 deg. F., it will rise to 2,500 kW at 260 deg. F. The average loading over the whole period will be approximately 1,500 kW, but expenditure must be incurred on switchgear, cables, and a heater adequate for the maximum loading which can be attained.

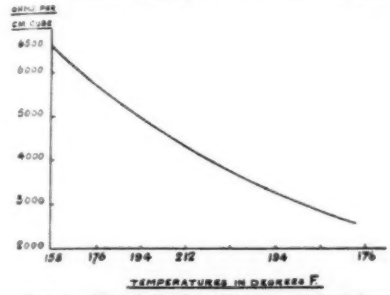


Fig. 1.—The fall of resistance with rising temperature

At first sight the best solution appears to lie in providing each electrode with a porcelain sleeve or shroud which can be raised or lowered with reference to the fixed electrode and thus obstruct the free flow of current in the water. Such sleeves are mounted on a common framework which is raised and lowered inside the heater shell by means of a central lead-screw. This passes through a gland, and is driven from outside by means of an electric motor or by hand.

At the beginning of the heating period the sleeves are in their highest position so that the electrodes are completely uncovered. As soon as the heater current rises above a pre-set limit the sleeves are automatically lowered and the electrodes so far covered that the former current is once again obtained. A further condition is frequently imposed that the sleeves must remain in the lowest position until the main circuit-breaker has closed, and also return to this position prior to the breaker tripping. On the resumption of supply after a failure the sleeves must be automatically lowered to the minimum position before the main circuit-breaker can close.

In earlier plants these requirements were met by a control system incorporating a large number of relays, contactors, and limit switches, but the heavy cost and unreliability due to the interdependence of the many units led to a very considerable simplification of the electrical gear.

Unified Operation

By the use of the main control relay shown in fig. 2, auxiliary relays and contactors are eliminated. The underlying principle of the system is :—As soon as the time-switch T (fig. 3) switches in the pump is automatically started up. The pump contactor P incorporates an interlock I, which closes when the contactor contacts close and thus completes the circuit to the solenoid HS. This causes the arm A to assume a horizontal position. Since, however, the main current has not yet reached its maximum value, the contacts of the current relay MR (which is set to the normal maximum current of the heater) are still closed, so that the solenoid US is energised. The arm A then swings over to the left hand side and the two-way mercury switches MS and MS (connected directly in the circuit of the motor which raises and lowers the sleeves) bridge over and cause the sleeves to be propelled upwards.

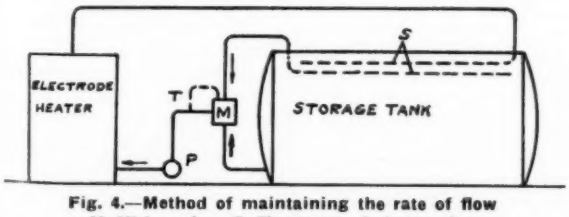


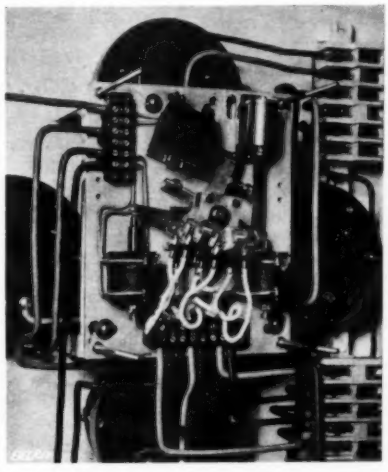
Fig. 4.—Method of maintaining the rate of flow
M. Mixing valve. T. Thermostat. S. Sparge pipes

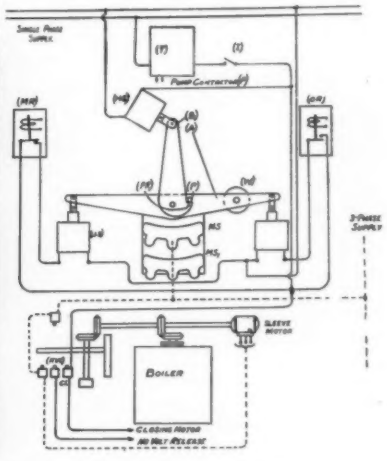
The arm A is not rigidly connected to arm B, although both are arranged to rotate about the central spindle. Arm B, however, is fitted with a projection Pr which engages with a pin P mounted in arm A. Thus, when B is moved by its appropriate solenoid, A is lifted into the horizontal position, after which it can continue under the action of solenoid US irrespective of the fact that B is now incapable of further movement. This method ensures that the normal position of the arm is quite horizontal.

Providing the limit switch CL is closed (which can only happen when the sleeves are in the lowest position) the closing motor operating the main circuit-breaker is also set in motion as soon as the pump interlock is bridged. The circuit-breaker thus closes simultaneously with the starting up of the pump.

As the sleeves rise the loading of the heater also rises, until ultimately current relay MR operates and cuts off the supply to solenoid US. This allows the arm A with its mercury tubes to resume a horizontal position, thereby bringing the sleeve-raising motor to rest. If the maximum current is not reached before the sleeves attain their highest position a special double-pole limit switch is operated which switches off the motor direct.

Water is now being steadily circulated between the heater and the storage tank, and its general temperature is increased. As this causes a corresponding increase in the electrical loading, after a short period the second current relay OR (which is set somewhat higher than MR) trips and energises the second solenoid which then tilts the arm A into the right hand position. This enables the mercury switches, the end connections of which are appropriately crossed, to start up the sleeve motor in the opposite direction and lower the sleeves until the normal maximum current is again indicated. The relay OR then falls back and remains in this position until the current again rises above the permissible maximum.





Figs. 2 and 3.—A main control relay and diagram showing operation

The sequence continues throughout the heating period and maintains the loading of the heater approximately constant. At the end of the heating period the time switch trips out and renders all the solenoids of the main relay dead. This results in the counterweight W swinging the arm A into the right-hand position, thus allowing the mercury switches to start up the sleeve motor and lower the sleeves.

As the sleeves approach the bottom of their travel the limit switch CL is first closed, and then the upper contacts of the limit switch NVL are opened (which breaks the no-volt circuit of the main circuit-

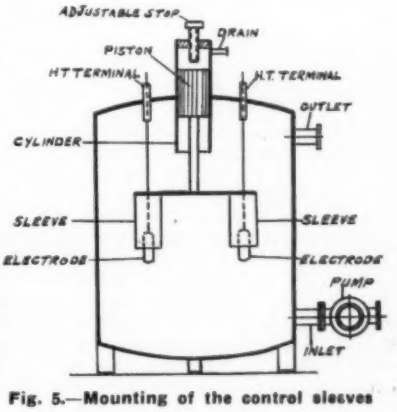


Fig. 5.—Mounting of the control sleeves

breaker, thus tripping it). Finally, the lower contacts of this switch are bridged, thus restoring the no-volt circuit. Ultimately, the lower double-pole limit switch is operated, bringing the sleeve motor to rest.

Avoiding Overloading

Although this system is satisfactory in practice, it must be considered as a compromise, because in order to prevent local overheating and boiling, and also to ensure a reasonable life for

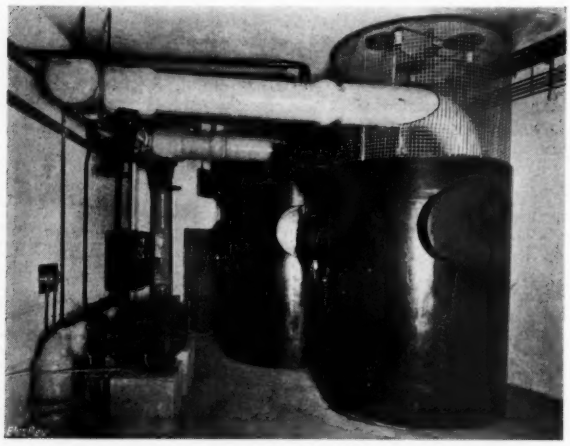


Fig. 6.—The plant at the Manchester Central Library

the electrodes their surface must not be loaded above a certain current density. If this figure is reached when the heater is first switched on, overloading begins as soon as the sleeves descend, since the same current is then being dissipated from a smaller surface. Eventually the whole current is carried by a small proportion of the total electrode surface so that an overload of up to 300 per cent. results.

It has been suggested that the electrodes should be made so large that even when three-quarters are covered the safe specific surface loading is not exceeded, but this would result in a large and costly heater. Most of the electrode circulating heaters represent a compromise. A method by which the output of an electrode circulating heater can be maintained constant without lowering the sleeves has been developed that enables a smaller heater to be employed; this is claimed practically to eliminate electrode and other renewals.

Attempts to keep the loading from fluctuation through maintaining the temperature inside the heater substantially constant by throttling the circulating water (thus increasing the temperature rise per circulation) have the disadvantage, particularly with high-voltage heaters, that the reduced rate of flow conduces to local overheating and steam generation. In the following method the rate of flow is not diminished.

The storage tank is fitted with two adjacent inlet sparge pipes arranged parallel as shown in fig. 4. One of these pipes is connected direct to the heater and the other to one side of a standard thermostatic hot-and-cold-water mixing valve. The other side of this valve is connected to the bottom of the storage tank, and the output is taken via the circulating pump to the inlet branch of the heater. The thermostatic bulb is placed in the pipe between the valve and the pump. At temperatures below about 260 deg. F. the path between the bottom of the tank and the heater is closed, so that water can only circulate between the two sparge pipes.

Since the temperature at the top of the tank is higher than that at the bottom, the loading of the heater is thus already higher than would be the case with the orthodox arrangement. Furthermore, the comparatively small quantity of water in the vicinity of the sparge pipes is being continually recirculated through the heater, with the result that the temperature of the water issuing from the mixing valve undergoes an extremely rapid rise. Consequently, the rating of the heater rises quickly to maximum. As soon as a predetermined flow temperature is reached the mixing valve operates and admits cool water from the bottom of the tank. Thus the flow temperature to the heater (and therefore its electrical loading) is maintained constant until the desired maximum storage temperature is reached.

Direct-heating Systems

A modification of this principle can also be employed when no thermal storage is required, *i.e.*, when the flow from the heater is passed direct into the heating system. As before, the flow of water through the heater is in no way diminished, but the loading is maintained substantially constant almost from the moment of switching on. Although the sleeves are not used for this purpose, they can be brought to a lower position at any time by hand in order to limit the value of the maximum rating of the heater in accordance with varying weather conditions, without overloading the heater.

Motor-operated raising and lowering gear for the sleeves is necessary, since the main circuit-breaker should neither be closed nor tripped with the heater at anything but its minimum loading. To avoid the expense of this gear it has been suggested that the circulating pump might be utilised for the purpose by suspending the control sleeves from a kind of piston mounted inside the heater. With the pump at rest, the piston would drop by gravity and reduce the loading of the heater to a minimum. On restarting the plant, the pump (which would be interlocked with the main circuit-breaker) could start up only after the breaker had closed, and the sleeves would then rise slowly to the top (fig. 5). An adjustable stop for the piston would determine the maximum output. At the end of the heating period the time switch would trip the pump contactor and cause the sleeves slowly to fall under gravity. As soon as the falling sleeves had reduced the current to a pre-set value the main circuit-breaker would then be tripped by means of a contact ammeter connected in the no-volt coil circuits. The use of this system would eliminate relays, control being effected entirely by a multi-contact time switch.

Fig. 6 shows the first plant to be fitted with the single-relay control system described at the beginning of this article. The installation provides the entire heating for the new Manchester Central Library and has a maximum total loading of 6,000 kW. Except under abnormal winter conditions, however, the rating of each heater is maintained constant at 2,000 kW.

Acknowledgments are due to Messrs. Siemens-Schuckert (Great Britain), Ltd., for the data given in this article.

Ultra-violet Rays. By John Tutin, D.Sc.

Recent developments in methods of production

THE essential difference between a gold atom and a mercury atom, apart from the nucleus, is that the former has one electron in its outer shell, whilst the latter has two. It is to one of these two outer electrons that we are indebted for the abnormally rich ultra-violet radiation which is produced from mercury.

When suitably excited, this "optical" electron leaves its orbit in the constellation and soars away into space passing through a succession of levels, at any of which it may momentarily pause, resuming its journey when a fresh impulse reaches it.

Its progress is not unlike that of an automatic lift which can only stop at floor levels and not at intermediate positions, and requires a specific amount of energy for each stage of the climb.

When the energy supplied has been absorbed, the electron finally settles momentarily in the highest level which its energy permits it to reach. After a pause of roughly one hundred-millionth of a second, the "descent" begins. What happens then is as though our automatic lift could, to some extent, exercise free will, and either return at once to the ground floor, or, at discretion, stop at certain floors but not at others.

This limitation is of considerable practical importance in the commercial production of ultra-violet rays from the mercury atom, but its physical interpretation is extremely obscure. The electron can pause at a given level only by getting rid of surplus energy. This is quite in line with ordinary mechanical principles. When it has returned to its normal level it will have dispossessed itself of the whole of the energy of excitation originally imparted to it at the beginning of its outward flight.

Electro-magnetic Radiation

The energy is got rid of in the form of electro-magnetic radiation, but here classical mechanics is faced with an insuperable difficulty in interpreting the mechanism of this process, and one must turn to wave mechanics. After each stage of the descent there is a definite quantity of surplus energy, and this is at once emitted as a radiation of a particular wavelength, corresponding to a frequency which is proportional to the energy available.

In this way the return of the electron to its normal state gives a series of brief radiations each having an appropriate wavelength corresponding to a particular stage of the descent. If the energy to be emitted in respect of a given stage is such that the corresponding wavelength is forty-millionths of a centimetre or less, the electron is emitting ultra-violet radiation.

The unique value of the mercury atom in producing ultra-violet radiation is, first, that it is the most easily excited of the monatomic gases. Secondly, under suitable conditions there is a special probability that the excitation will generate frequencies corresponding to ultra-violet radiation. In particular, if the atom absorbs an energy slightly in excess of 4.86 electron-volts, the optical electron is able to reach the first level, from which it returns to its normal level emitting radiation of wavelength 2,536 Angstrom units, which is in the ultra-violet range, and, although not necessarily the strongest, is one of the most valuable. Further, the line 2,536 of mercury is believed to be unique in that the life of the excited atom in the state corresponding to this line is about five times the normal.

Theoretically all that is necessary in order to produce ultra-violet radiation from mercury is a comparatively slight excitation. In practice, however, the means of excitation become the predominant factor.

A free electron is usually the most effective means of exciting an optical electron bound to the parent atom. The most convenient scource of free electrons is the parent atoms themselves. Thus the optical electrons are excited to the point at which they are completely detached from the parent atoms and free electrons are then available for the purpose of exciting the ultra-violet radiation. For this purpose, the ionised parent atoms are themselves effective on collision with a normal atom.

Low Collision Efficiency

When mercury vapour is bombarded by a stream of electrons, each collision between an electron and an atom does not necessarily result in an excitation, as the collision efficiency is surprisingly low, giving only about one excitation per 1,000 collisions at the appropriate voltage. Curiously enough, if the voltage is somewhat in excess of the correct figure, the efficiency may fall to about one-quarter of the above value.

Somewhat similar conditions apply to the complete removal of an electron at the ionisation potential of about 10.4 V, and at any voltages that are in excess of this other outer electrons may be removed in addition to the "optical" electron. For example, atoms of mercury have been observed from which as many as five electrons, have been removed by electron bombardment below 150 V, whilst Tonks states that at this potential the number of doubly charged ions is 50 per cent. of the number of singly charged ions, and the number of trebly charged ions 12 per cent. Mercury and the inert gases, neon, argon and krypton, are remarkable for the ease with which their outer electrons may be removed. This explains the special value of these gases in discharge tubes, and even small traces of other gases should as far as possible be excluded; even the vapour from a trace of stop-cock grease has a damping effect on the discharge.

Important developments have taken place during the past few years in the production of ultra-violet rays from mercury vapour. These developments have proceeded side by side with the modern application of mercury vapour for lighting purposes, particularly for street illumination. The early work of Arons, who in 1896 devised a mercury-vapour lamp with a low-pressure discharge and a glass envelope, was followed by the invention of the tilting burner by Kuch and his collaborators. Recently, as a result of the investigations of Spanner, a new burner has been produced by the Hanovia Company and its associates abroad. This operates with solid electrodes and is "self-started" through a glow discharge in argon as an auxiliary gas to the mercury vapour.

A Variety of Electronic Processes

In a mercury-vapour discharge a large number of different electronic processes may be in operation simultaneously, most of which can be brought under electrical control: (*a*) excitation of atoms by free electrons, (*b*) ionisation of atoms by free electrons, (*c*) excitation and ionisation by positive ion impact, (*d*) exchange of charge between positive ions and normal atoms, (*e*) ionisation of a normal atom by a fast moving normal atom (kinetic ionisation), (*f*) ionisation of an atom by an excited atom of a different gas, (*g*) ionisation of an atom by photons emitted by excited atoms, as for example, by ultra violet radiation, (*h*) ionisation of an atom by cosmic rays or by traces of radio-active matter, (*j*) ejection of electrons from the cathode due to impact of ionised atoms, (*k*) emission of electrons from the cathode due to thermionic and photo-electric effects, (*l*) extraction of electrons from the cathode by the electrostatic field of the positive ions when approaching it (this field may have a value of the order of half a million volts), (*m*) + or − ionisation of atoms on the tube's inner surface, (*n*) impact between a metastable excited atom and a slow moving normal atom of the same or of a different gas, whereby the normal atom is excited and the metastable atom is able to return to the unexcited state without radiation. A metastable state occurs when the excited electron reaches a level from which a return to normal is a forbidden transition. The electron must then await a further excitation to enable it to go to a different level, or alternatively, transfer the whole of its residual energy of excitation to another atom by collision. Thus the life of a metastable may be over 100,000 times that of an ordinary excited atom.

[*C. Vandyk, Ltd.*
Dr. J. Tutin

In the tilting burner the discharge is started by a short-circuit as the mercury stream falls back to form the electrodes. The heat developed at the terminal points of the arc produces vaporisation of the mercury. This is a reasonably satisfactory arrangement, but it is somewhat cumbersome, and the lamp can be operated only when the burner is in a certain position. Starting is not positive, and its operation is dependent on temperature equilibrium owing to the large amount of liquid mercury at the terminals.

The ideal arrangement has always been a sealed tube containing exactly the correct amount of mercury, so that when the whole of this has volatilised, the desired vapour pressure is automatically secured. This calls for solid electrodes, and the achievement of the ideal has centred mainly on the production of the correct electrode capable of starting and maintaining the discharge in this type of burner. This problem is claimed to have been solved in the Hanovia design.

Cosmic rays and the minute quantities of radio-active material present everywhere in the earth's crust are frequently regarded as matters of purely academic interest; nevertheless, the new type of mercury-vapour lamp actually starts up initially with the aid of one or both of these external agencies, which provide a "natural" ionisation of about two ions per cu. cm. per second in air, whilst in argon there may be as many as 100 ions per second per cu. cm. A small quantity of argon is therefore sealed into the tube with the mercury.

Liberation of Electrons

When the voltage is applied to the solid electrodes, electrons begin to move inside the tube towards the anode under pressure from the applied potential. On their journey to the anode other electrons are liberated by collision, and they in turn liberate others. In this way the current rapidly amplifies and eventually a stage is reached at which positive ions of argon strike the cathode with sufficient energy to eject electrons from the cathode surface by impact. This starts a glow discharge in the argon, which in turn heats up the electrodes and vaporises the mercury. The discharge is now self-maintained and the current will take up the value determined by the circuit resistance.

In a high-pressure discharge ionisation is mainly due to the high temperature of the gas and is, in fact, "kinetic ionisation." At the cathode, when the tube is in equilibrium, the current is largely maintained by thermionic emission of electrons from the oxide deposit. The bombardment of the cathode by positive ions tends to destroy the thermionic material, excited atoms escaping from the surface. According to Hull, most of these atoms encounter metastable ions of mercury close to the cathode, and become ionised. They are then recaptured by the cathode. In this way the thermionic surface has several thousand hours of life whereas, ordinarily, the life would be a few hours only.

A Snow Remover for Overhead Lines

In a recent issue of the *Electrotechnische Zeitschrift*, Herr O. Strand describes a new device for removing snow and ice from electric power transmission lines. It comprises a kind of cutting knife attached to a light single-wheel carrier. The latter is fixed on the cable to be cleared in the vicinity of a supporting mast and then by means of suitable connections it is drawn along the cable, clearing the ice and snow during its travel. It is stated that the method is in successful use on a 132-kV line between Oslo and Nore in Norway and that it can be effectively used even while the cable is "alive."

Electric Cooking Campaign at Poplar

ACTUATED by a desire "to bring electricity as a beneficent force into the lives of the poorest of our people"—we quote the words of Alderman C. W. Key, chairman of the Electricity Committee—a series of demonstrations was held at the East India Hall, Poplar, London, E., last week. The campaign was one of the most successful of its kind, and any doubts which may have existed as to the demand for a cleaner and more satisfactory method of cooking than the old-fashioned, fume-producing stoves, were dispelled by the enthusiasm displayed on each occasion.

Altogether, over ten thousand people witnessed the demonstrations and heard propounded many convincing arguments in favour of electric cooking, twenty thousand invitations having been sent out by the Electricity Department (electrical engineer, Mr. R. Illingworth) working in conjunction with the General Electric Co., Ltd. Thus, assuming an average of five persons in each family, the campaign brought the merits of electric cooking before about a third of the population of the borough in the brief space of four days. Results were immediately forthcoming, for on the first day over a hundred applications for cookers were received, and this was repeated on the following days.

The illustrations show the stage setting which contrasted old and new methods of cooking, and a typical gathering at one of the demonstrations

We were present at the demonstration on Thursday afternoon and found the stage effects exceedingly good. A preliminary dialogue between a slightly sceptical "parrot" (with a pronounced Cockney style) and one electrically minded paved the way for disclosing the contrast of old and new kitchens, as illustrated on this page. Criticisms of electric cooking were answered and some of the incidental expenses of other systems not usually considered—such as at least three boxes of matches a week—were pointed out. Afterwards, lady demonstrators of the G.E.C. gave cooking displays.

Details of the Department's new scheme for bringing electric cookers within the reach of all (referred to in our last issue) were given by Alderman Key. A "Magnet de Luxe" all-enamelled cooker is installed and maintained at the Department's expense, the only charge being 1d. per kWh consumed, paid through a prepayment meter. An aluminium kettle especially suitable for the cooker is also provided free. As an alternative, in cases where there are large families, the cooker can be hired at 3s. 6d. per month, in which case the rate of charge is ½d. per kWh.

Safety for the Consumer. By Herbert James

ELECTRICAL accidents are always deplorable. A Press report of such an accident must cause something of a shock to all electricity consumers, who are led to look upon electricity as a valuable and almost indispensable servant. They are greatly perturbed by the thought that the servant they have become accustomed to treat with familiarity may some day turn on them or their families.

Supply authorities too, are just as much concerned, though in a different way, and an accident of this nature serves to stimulate the issue of regulations designed to ensure as far as possible the safety of electricity users. The I.E.E. Regulations for the Electrical Equipment of Buildings, and the Electricity Commissioners' Regulations, are designed to cover as far as possible, in their respective fields, the potential sources of danger. Each of these sets of regulations is excellent so far as it goes, but in every case much is left to the good sense and co-operation of the person whom the regulations are designed to protect.

The fostering of this co-operation and the development of this good sense would appear to be the job of the supply authorities and E.D.A. The aim should be to educate consumers to know how far they can use electricity without taking liberties. No regulations, however comprehensive, can cover all contingencies. All the care and foresight expended in the preparation of Regulation 1002 relating to bathrooms in the I.E.E. Regulations, cannot prevent a housewife buying a bowl fire and using it from the lighting socket in the bathroom.

Electricity undertakers sell in their showrooms all kinds of small articles for use from a lampholder, and for some of them, such as curling irons, hair dryers, illuminated shaving mirrors and massage equipments, the natural place for use is the bathroom. A host of other articles, such as irons, bowl fires, etc., are frequently used in kitchens with tiled floors. This kind of thing is admittedly bad practice, yet supply authorities have tacitly encouraged it for years. Every showroom, contractor, and even multiple store, sells two-way lampholder adaptors, and quite naturally consumers use them. In fact it would be difficult to find a dwelling house in the country, using electricity, without one. Admittedly they are very useful articles, but the effect of I.E.E. Regulation 1002 would be worse than negatived should a consumer elect to use a portable appliance *via* an adaptor from the bathroom light.

The doctrine of *caveat emptor* should not apply in the sale of electrical appliances, particularly domestic appliances, where the buyer is not credited with much technical knowledge. Rather should it be the duty of supply authorities as far as possible, tactfully to educate the consumer in the proper use of the appliances which he buys. Not every case would react to such education, and some would be very difficult. The typical "handy man" would be a problem. My attention was drawn some time ago to a case in which the handy man of the house had fitted a long flex to a kettle (unearthed) so that it would reach to the water tap without being switched off. A more deadly piece of work can scarcely be imagined, yet he would not be convinced that there was any risk!

It would therefore appear that, without educating the consumer electrically to a certain extent, any Regulations imposed upon undertakers and contractors will be of little avail. There will always be a large number of loopholes through which somebody can receive a shock.

Why not an "Electrical Education" campaign? Of course great care must be used in order not to frighten people. The thing to avoid most of all is impressing the consumer with the dangers of electricity. But what could be more calculated to "put the wind up" the man in the street than a copy of the I.E.E. Regulations, should one come into his possession.

Supply authorities have an excellent method of approach. They send out their accounts quarterly, and a series of carefully worded pamphlets enclosed with the accounts would form a material contribution towards the education of the consumer which is so desirable.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Oil-engine Working Costs

AT a meeting in London on January 23rd the DIESEL ENGINE USERS' ASSOCIATION considered the report which is compiled each year by one of its committees on heavy-oil engine working costs.

It has been observed that as the output of public electricity supply stations has fallen, due to the operation of the grid system, other stations have been erected or existing private stations have increased their output, so that on the balance the output of stations covered by the report has increased. This tendency has been maintained during the year under review (1933-34).

The effect of the fuel tax was a rise in the average price per ton of fuel oil paid by the home stations from 62s. to 77s. 4d., *i.e.*, by 25 per cent.; the percentage average rise would have been greater but for the facts that one or two stations (whose returns cover the period January to December, 1933) only paid tax from about April, 1933, and that others changed over to a heavier and cheaper fuel.

Conditions prevailing in many of the stations included since the advent of the grid system need careful stressing, lest wrong conclusions be drawn. At Worthing, Maidenhead, Alderley Edge and Chiswick the oil engine plant is used for peak loads only, while the engines at the Epsom station are now definitely used for stand-by purposes only. Annual station load factors for these four peak load stations were from 7.2 per cent. at Worthing down to 2.5 per cent. at Alderley Edge and 2.5 per cent. in the case of Chiswick. At Epsom the total time during which any portion of the oil engine plant was in operation was only 356 hours and the oil engine station load factor averaged 0.8 per cent. over the year. Such conditions as these (leading, as they do, to abnormally high costs per kWh generated) suggest that it is not advisable to continue to include such peak load and stand-by stations in these reports in the same way as more normal stations are set out.

During the year under review, in those stations included in the report, thirteen new engines totalling 4,180 b.h.p. were installed; six of them totalling 1,610 b.h.p. were installed overseas. They were all of the four-stroke type, five utilising air and eight airless injection.

The average annual station plant load factor at home remained about the same as in 1932-33, the drop in output of many of the public supply stations being offset by the larger specific output from some of the industrial private plants and by the fact that the three Crittall stations (with annual load factors of 30.9, 28.9 and 19.1 per cent.) are included. Lubricating oil average cost per gallon remained unchanged. Average lubricating oil consumption was about 10 per cent. less, falling from 2,080 to 1,900 rated b.h.p.-hours per gallon; the three Crittall stations had an adverse influence, because if the average of the home stations is taken without these three stations the figure then becomes 2,080. The total cost per kWh generated rose by 9 per cent., the 25 per cent. increase in the item for fuel oil and 6 per cent. increase on lubricating oil more than cancelling reductions on the other three items.

It appears from the record of the station belonging to Messrs. Douglas Fraser & Sons, Arbroath (total cost 0.347d. per kWh), that a serious rival has arisen to Crompton Parkinson, Ltd., for the position of the station returning the lowest consistent cost per kWh generated.

The higher annual load factor resulting from the advent of the Broken Hill station into the reports on overseas stations continues. Fuel and lubricating oil costs per ton and per gallon are slightly lower and the average lubricating oil consumption was 7 per cent. less. The total cost per kWh generated fell by 2¼ per cent., the improvement being fairly uniformly distributed among the five items, except lubricating oil cost, which showed a slight increase, and the repairs and maintenance, which fell by 4¼ per cent.

Both average fuel consumption per kWh generated and running plant load factor remained close to previous figures and for the second time in the history of these reports the average of all stations improved on the standard curve, this year by 2 per cent. The average of 0.642 lb. per kWh generated at 67.5 per cent. load factor corresponds to a thermal efficiency of 27.3 per cent., based on a gross calorific value of 19,500 B.th.u. per lb. The standard of 2,380 rated b.h.p. hours per gallon was improved upon by twenty-one stations.

Repairs and maintenance per kWh generated cost 0.85d. in home and 0.062d. in overseas stations, representing decreases of 0.002d. and 0.003d. respectively. Repairs and renewals averaged 13.5 per cent. of the total running charges.

Radio Interference Suppression

THE paper on broadcast radio interference by Mr. J. Neale, of the General Post Office, to which we referred in our last issue, was discussed before the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on January 21st. Mr. J. R. Cowie presided.

Mr. H. Bourne stated that if condensers were connected across the phase and neutral of several sockets in each of thousands of houses, the total leakage might be very appreciable.

Mr. M. Lee said that a radio frequency choke in the earth lead, if it had a resistance not exceeding one ohm, would give quite good earth protection and seemed every bit as good as severing the earth lead. On networks with an unearthed neutral strange effects were produced. He appealed to authorities with unearthed services to allow the suppressors to be fitted on their side of the meters. For short-wave work and television earth chokes would become still more important. Following the introduction of a new cooker hiring scheme in London consumers complained that the tuning of their radio sets was upset because the aerial was picking up interference from the wiring of the house. The difficulty had been overcome completely by fitting choke coils in the earth wires of the cookers.

Mr. A. J. King (Metropolitan Vickers Co.), discussing the

A group at last week's dinner of the Western Centre of the I.E.E. Readers will recognise Prof. W. M. Thornton (the President), Mr. P. F. Rowell (Secretary), Mr. R. Hodge (Chairman of the Centre), Ald. W. Walker, Mr. A. Nichols Moore, Mr. A. J. Newman, Mr. A. Ellis, Mr. S. B. Haslam, Mr. J. Snow Huddleston, and other well-known electrical men

point at which to place a choke on a tram or trolley bus, said that the roof provided good facilities for cooling and it was near the overhead equipment. Mr. T. H. Kinman said that the manufacturers' problem was economic rather than technical. Methods of suppression which might be satisfactory at home might not apply in the Dominions and Colonies because of the different broadcast frequencies involved and the greater sensitivity of receiving sets used overseas. The use of special powdered iron cores in moulded form merited attention as a means of facilitating manufacture and improving the efficiency of radio-frequency choke coils.

Mr. Neale pointed out that the use of the one-sided condenser arrangement with 157 mA between line and neutral which did not flow to earth could not be termed "leakage." It was a 90 deg. leading current directly across the supply. The effect of that occurring at a number of premises might in some cases be serious, but he believed supply undertakings generally had found that the net result was an improvement of power factor.

Choke coils in the earth leads had been used for certain rectifiers, rotary and valve. Earthing often increased interference, but the reason for urging that earthing should be adopted for portable appliances was that one could then suppress interference with safety. The use of double impedance filter circuits of the small current type for trolley buses in conjunction with screened wiring had very great possibilities and might hold its own with the heavy current choke coil in the leads from the collectors.

Mr. E. G. Cropper referred to some tests at wavelengths down to 15 metres, the general findings having been that a series of chokes was necessary in the leads to the plant which gave rise to the interference. The main improvement was brought about usually by disconnecting the frame of the machine from earth, and any further suppression necessary was best effected by connecting a doublet type of aerial to the receiver. The two could be worked together. Mr. Kinman said that he had carried out some investigational work at wavelengths down to 10 metres in respect of small domestic appliances, and had found that when a standard suppressor was fitted to the base or handle of the domestic appliance there was considerable radiation from the brush leads and the leads connected with the suppressor. Interference on the shorter wavelength could be reduced very effectively by using a brush capacitor of not more than 0.2 mfd. Mr. J. P. Morley (hon. secretary of the Group) said it seemed that in the future all wiring rules should include a provision that the wiring should not interfere with radio unduly, and that the power factor of the a.c. system should not be increased beyond the limits laid down by the supply authorities.

Mr. Neale, replying, said that the effectiveness of the filters which he had described in the paper was reduced steadily as wavelengths became progressively shorter than the ordinary broadcast band, so that the introduction of television on wavelengths below 10 metres would cause very serious thinking and possibly the troubles that would arise then would make present efforts appear insignificant. There was no interference from gaseous discharge lamps of the mercury or sodium types, but there was interference from neon lamps, which could be suppressed quite easily, however.

If a number of plug points were installed very close together, and the wiring really paralleled them all up, possibly one condenser unit would cure interference from several plug points. That could be done for distances up to several yards, because the leads were parallel and the inductance was not great. The Post Office preferred to cure interference at the source rather than to fit suppression units on complainants' premises.

Vehicle-actuated Street Traffic Control

THE paper on this subject prepared by Mr. T. P. Preist, to which reference was made last week, was read and discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 24th.

Mr. A. E. N. Taylor, Roads Department, Ministry of Transport, said that he and some of his colleagues were not prepared to go quite so far as the author had done in his advocacy of vehicle-actuated signals. If traffic-change cycles were regular mechanical equipment could be devised. In terms of accidents caused, fixed time signals were almost on the same footing as police control. Vehicle actuation would go a long way, but it was not yet entirely efficient. It was not fair to suggest that this system could be classed as simple engineering; in traffic signal development Britain had gone far beyond all other countries, even the United States which was its home.

Complexity and Maintenance

Mr. B. O. Anson agreed that this method was not so simple as the author's diagrams might suggest. Complexity would be one of its features in future and the maintenance problem might have to be solved in the same way as it had been done in telephone exchanges, namely, by the provision of auto-routiners and testing facilities. The system in use at Amsterdam pointed the way, for there all the operating mechanism was installed in the telephone exchange, the impulses being transmitted by wires to the street signals. One authority owned both telephone and signal systems and the same staff serviced both. This method would involve the use of many wires, but that difficulty might be overcome.

Mr. H. G. Edwards briefly described the flexible progressive system and inquired how it might be combined with vehicle actuation in respect of side streets which required right of way only at very infrequent intervals. Some such scheme would eliminate the disadvantage of the flexible progressive system on a fixed time basis. He suggested that the author's type of road detector mat might be affected by temperature variations, and that steel was not a good contact material to use.

Mr. N. Herwald discussed technicalities and reasons for including the amber light in the signal sequence, suggesting that the timing of pedestrian-crossing intervals was incorrect. Press buttons for pedestrians should be provided.

Mr. S. Grim considered the initial interval allowed for the clearance of vehicles standing between the detector mat and signal to be too long for one or two vehicles and too short for dense traffic. Consequently, subsequent detection was sometimes prevented, which brought traffic to a standstill.

What is the Amber Light for?

Mr. A. J. H. Clayton, Ministry of Transport, had doubts about varying the amber time as described in the paper. It was not intended merely as a means of clearing the junction, and in some cases it was preferable to have a fixed amber time length. The "hurry call" was convenient, but had disadvantages in heavy traffic.

Mr. J. Reading wanted to know what the amber signal was intended to signify. If it merely permitted vehicles which had already crossed the detector mat to get away, why did not the Ministry of Transport say so?

Mr. W. F. Adams, Ministry of Transport, said that the maximum timer system was cheap and so was often used, but it was not suitable for all situations. Some of the author's diagrams were out of date and others appeared to have suffered in translation from the American versions. The use of the flexible progressive system in combination with vehicle actuation was quite practicable.

Mr. H. E. Morris pointed out that with the author's split-pad unidirectional detector the operating time was exceedingly short. Did that involve the provision of discriminating relays of special design? Mr. Jervis Smith asked for the watts consumed per signal, how long the equipment took to install, and its cost, or the ratio of the cost of plant to cost of installation.

Mr. T. P. Preist, in reply, claimed that because vehicle actuation did not remove the right of way arbitrarily it was dangerous to a less degree than fixed time signals. About equal numbers of the two systems had now been installed in this country. While the vehicle-actuated method was not perfect it was very efficient and was still being developed. The adoption of 260 V for the timing circuit was somewhat accidental. It had depended on the production of a neon tube with a stable characteristic, and the first good one made happened to have that striking voltage. The system adopted in Amsterdam had also been used in the United States and Berlin, but its application was limited, since it was extremely costly and it was difficult to zone districts suitably.

Wireless Aids for Air Navigation

IN addition to its "homing" device, which demonstrated the value of wireless aids to air navigation of the class independent of special ground organisation, Marconi's Wireless Telegraph Co., Ltd., has acquired exclusive rights of Smith and Meredith's radio azimuth patent No. 357968, as developed by the Royal Aeronautical Establishment, Farnborough, and Simon's radio range and direction finder (Radio Navigational Instrument Corporation). The familiar "homing" device provides visual indication, particularly for fog landing operations, a dial needle showing the direction of any deviation and also an approximate indication of its extent.

The Simon radio range and direction finder is an American invention which does not require special beacons or direction finding stations on the ground. It gives visually the bearing of any wireless transmitting station in degrees and at the same time an approximate indication of its distance in certain circumstances. The Simon apparatus employs two small loop antennæ, arranged at an angle to each other, and each connected to a separate superheterodyne receiver. A dashboard meter gives simultaneous visual comparison of the relative voltages in the two loops, and the direction of the transmitting station is thus indicated.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Machine Tool Electrification

Referring to Mr. Sims's article in your issue of January 11th, I must strongly challenge the statement made that "one well-designed overload trip per motor gives all that is required on a machine tool or woodworking machine, and should become the recognised and accepted practice. The sub-circuit fuses will take care of earths or short circuits," as apart from pure overload protection control gear to give *adequate* protection should operate in the event of the motor operating on single phase due to interruption of any supply lead by a blown fuse or broken or loose connections.

It is obvious that with control gear having one overload release only no protection whatever would be offered assuming an open circuit occurred in the particular phase carrying the overload, and thus the motor would continue to operate on one phase of the supply and a partial burn-out of the motor windings would occur.

I have specialised in service work and there is absolutely no doubt from my records that partial burn-outs due to "single-phasing" are quite as many as, if not more than, burn-outs due to overload. Let us have simplified control gear by all means, but the first consideration should be to protect the motor adequately which must include protection against "single-phasing" which could not possibly be expected from control gear fitted with one overload release only.

January 21st. TORQUE, A.M.I.E.E.

Unusual Commercial Transactions

The transaction between Messrs. Higgs Motors, Ltd., and a firm in Iceland, recorded in your last issue, under which the former supplied the latter with a motor in return for ¾-ton of haddock is certainly a unique one.

I had a rather more crude form of trading brought to my notice recently, although as the details were conveyed by a third party, I cannot vouch for their accuracy. The case concerned a farmer who wanted a starter for his threshing machine motor, but was temporarily short of cash. The firm of starter makers therefore accepted several loads of horse and hop manure which it disposed of to such of its staff as possessed gardens. By this means the firm got its money, the farmer his starter, and the gardeners their horse and hop manure.

This case of inter-trading ought to please a very well-known politician who has been ardently advocating his "New Deal" as it certainly betrays a wish to go "back to the land."

Manchester, *January 28th.* W. BRIGGS.

The Institute of British Executives

I was interested to see in the "Business and Industrial Notes" of this week's ELECTRICAL REVIEW the paragraph describing the work of the Institute of British Executives. From some considerable knowledge of the work which is being done by this Institute I should like to endorse the suggestion that every executive who is fortunate enough to be in a post ought to give it his utmost support both by joining as a member and by referring all the executive posts of which he may hear to its highly efficient Appointments Department.

From my own experience I know that every man's qualifications are carefully tested before being codified and that no one is admitted to the register until he has passed the rigid scrutiny of a selection committee, so that employers need have no doubts as to the type of man submitted for a vacancy.

I myself was glad to be able to give a hand last year to the Institute, and I should like to suggest that all who can should pay a visit to the Institute's headquarters (133, Oxford Street), where they will be deeply impressed by all they see. The vice-presidents include such names well-known to engineers as Sir William J. Larke, Sir Henry Maybury, Sir Walter Kent, Mr. P. V. Hunter, and Sir Harold Bowden, while many leading figures in the electrical industry have given their active and sympathetic support in various ways.

A. G. CONNELL,
Chief Electrical Engineer, Staveley Coal & Iron Co., Ltd.
Staveley, *January 28th.*

A Full-time Job

An advertisement appeared in a recent issue of the REVIEW under "Situations Vacant" inviting applications from electrical and mechanical engineers capable of wiring and maintaining what appears to be a private installation of some size.

The following particulars are culled from the application form:—(1) Engineer to reside in cottage provided on site (fuel and light free, a garden is included). (2) He will be expected to devote his whole time, attention and ability to his duties, and will not be allowed to undertake any other work. (3) The hours of duty will be: on week days from 6 a.m. to 10.30 p.m. (two hours allowed for meals in addition to 3½ hours off duty per day between 6 a.m. and 5.30 p.m.). By arrangement one day per week 6 a.m. to 1 p.m. Alternate Sundays off duty.

These arrangements are for approximately 70 per cent. of the year, the remaining 30 per cent. duty would be 6 a.m. to 5.30 p.m. The salary was not stated, but I understand that about £4 per week was the figure calculated to suffice.

I am wondering if the engineer's cottage will be in the loft over the engine room, and if he will be able to use the cylinder covers as bedwarmers. An alarm clock is not provided, nor is a gardener for the engineer's cottage garden. The duties of his wife are not defined. Probably cleaning bright work and wheeling out ashes will be allotted to her in due season.

January 22nd. ENGINEER.

A Distribution Problem

On an installation connected to an a.c. 240-V supply in Kent I found that I could get a reading of 415 V to earth when the neutral or earth fuse in the house was removed. When this fuse was replaced, the normal 240 V to earth was obtained.

This effect was pointed out to the supply undertaking's officials, who rectified it, but gave no reason for the irregularity. I should be glad if your readers would give possible explanations. R. E. L.

January 24th.

The Six-hour Shift

Mr. Goldsworthy states that he agrees with us that "the engineering profession is anti-social in its constant efforts to replace man power by machinery." We did not, however, make this statement, nor do we believe it to be true. What we actually said was "*if* the question is one of absorbing the constant army of unemployed into industry then the engineering profession is anti-social, &c."

On the contrary, we believe that the function of industrial activity should be to satisfy all the material wants of the nation by the least possible expenditure of human energy, that is to say with as much unemployment as possible. Unemployment is only an evil at present in so far as it restricts the ability of the unemployed to consume.

The efforts of engineers, scientists, inventors and industrialists have made possible great savings in the expenditure of human effort, but these benefits have been very largely nullified by the fact that the present financial system has not kept pace with modern production. Where the failure in the financial system lies may be seen by Mr. Goldsworthy if he examines the relationship between the financial cost of any article and the purchasing power distributed during its manufacture.

All industrial payments may be divided into two groups:—(a) All payments made to individuals (wages, salaries, and dividends; (b) All payments made to other organisations (raw materials, bank loans, and other non-personal costs). Now the rate of flow of purchasing power to individuals is repre-

A specially designed G.E.C. ceiling fitting of slightly obscured ribbed glassware using architectural lamps, at the Regal Cinema, Margate

sented by (a), but since all payments go into prices, the rate of flow of prices cannot be less than (a)+(b). Since (a) will not purchase (a)+(b) a portion of the product at least equivalent to (b) must be distributed by a form of purchasing power which is not comprised in the descriptions grouped under (a).

No alteration in the distribution of (a) payments, such as Mr. Goldsworthy's proposal, will make the ratio of (a) to (a)+(b) any nearer unity. P. K. DAVIS.

Belfast, *January 27th.* A. EARLS.

There is far too much apathy regarding the shorter working week among those whose good fortune it is to have comfortable jobs. On the other hand, those who are not so well off are afraid that they would lose money if shorter hours were adopted, Yet things cannot go on as at present for very many years, or else probably one quarter of the nation's workers will be unemployed.

Younger men who are doing well in the industry are disinclined to bother about it, but can they or anyone else look forward with equanimity to the prospect of their sons and daughters being unable to find employment after receiving a good education?

A shorter working week is undoubtedly one of the first desirable changes. I do not, however, subscribe to the six-hour shift for the following reasons:—Working six hours means leaving work at midnight; this may be all right in London, but in very few other cities is it possible to get transport at this hour, and who wants to walk three or more miles home? There are other drawbacks, too. I would prefer five eight-hour shifts to bring about the redistribution of work and wages in which lies the real hope of society.

January 27th. SANCHO PANZA.

The Torque of an Electrical Machine

I am extremely grateful to Prof. Cramp for his references to works and diagrams in which he claims the cross-flux is shown correctly. Unfortunately, I have only three of the six works available for reference, but the curious thing is that these three were among the textbooks which I had originally in mind. For instance, Barr shows the cross-flux practically radial in fig. 195, p. 322, and it is evident from the shape of the solitary line per pole that the curves were drawn by compass and intended to be qualitative only. In figs. 136 and 137 of the English translation of Thomaelen (fifth edition) no particular care appears to have been taken in drawing the cross-flux, many of the lines being radial and some having even the reverse of the correct slope. Fig. 314 of Hawkins is carefully drawn but shows the same characteristics.

Evidently Prof. Cramp's conscience refused to allow him to quote figs. 317 and 318 of Hawkins as these provide the strongest support for my contention. The other diagrams quoted by Prof. Cramp are beside the point as they deal with the resultant flux. EDWARD HUGHES.

Brighton, *January 26th.*

It is evident that Dr. Hughes and I are at cross-purposes regarding these diagrams, for I can see nothing wrong with Hawkins's figures 317 and 318. The matter must wait until we can meet, for at present we are trying to reach conclusions without agreeing upon premises, which is unfair to you.

Birmingham, *January 29th.* WM. CRAMP.

The Sheffield Appointment

The letter of "Reluctant Optimist" in your issue of January 11th is an apt reminder of the low remuneration of borough electrical engineers (especially those in charge of the smaller undertakings) in relation to their responsibilities.

The activities of the A.M.E.E. and the E.P.E.A. seem to be concerned with the larger undertakings only, and appropriate salaries have not been fixed for undertakings of less than 1,000-kW capacity. If the smaller undertakings are permitted, without protest, to underpay their engineers, this is tantamount to concurring with the prevailing conditions, and such a policy will tend to lower salaries in all cases, including the larger supply authorities.

Membership of the I.E.E. counts for little with the average committee man when interviewing a candidate. The type of question usually asked is: What is your present appointment? What results can you show for your work? What ideas have you for improving on those results? What are your capital outlays and working costs over the past few years? What revenue could you secure for so much capital commitment?

The engineer with practical experience should have little difficulty in answering such questions. Attempts are being made to confine municipal appointments to corporate members of the I.E.E., which refuses to allow its associates to become associate members unless they submit to an examination or satisfy it that they are qualified to hold a responsible position.

There is a number of associates who are chief engineers of quite large undertakings. These are mostly over forty years of age and attend an average of about three evening committee meetings a week, which leaves little time for both family life and academic excursions in order to convince another selection committee that they are qualified to hold jobs they may have occupied with success for many years. I know of cases in which corporate members with high paper qualifications have offered their services at figures below those advertised in order to secure the experience that many associates can claim to have had.

If a municipal supply engineers' section were formed within the Institution (on the lines of the Wireless and Transmission Sections) many evils could be redressed. Chief engineers might, for instance, be recommended for allocation to grades bearing a relation to the capacities of their undertakings.

The I.M.E.A., which inspires greater harmony than does any other body in municipal electrical matters, should also attend to the classification of undertakings with a view to enforcing an appropriate scale of salaries.

January 29th. MUNICIPAL ENGINEER.

Do We Need a Mascot?

Does the electrical industry really need a mascot? Does not the idea seem a little childish? The sudden craze for one has surely been induced by the creation of "Mr. Therm," and therefore the best the industry can produce will only be by way of imitation.

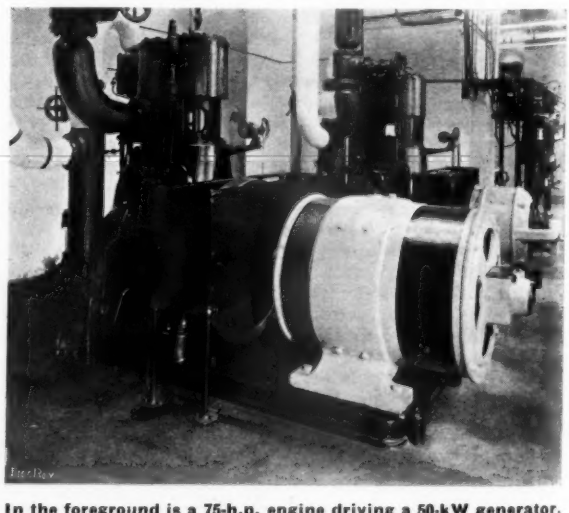
Surely enough confusion exists in the consumer's mind regarding the meaning of many of the electrical terms which are projected at him in various circumstances, and if he is going to be taught to associate some clownish figure with these terms he is likely to become more confused than ever. I suggest that such methods of propaganda are not dignified, and at their best can only provide ideas for fancy dress costumes for those who delight in the activities of gala nights.

Will the provision of a mascot sell more units? If the answer is "Yes" then one can only suppose that up to the present the intelligence of the consumer has been much overestimated and that he must be led by the hand back to the nursery if such poor methods have to be introduced to make him increase his use of one of the greatest means of comfort and cleanliness mankind has ever known. C. M. B.

January 28th.

Back-pressure Steam Engines

Figures relating to the costs of producing electricity from steam-engine sets, the exhaust from which is used for process work, are available from the experience of Messrs. Stafford, Allen & Sons, Ltd., of Long Melford, Suffolk. A Browett-Lindley 50-kW (600-r.p.m.) unit (installed in 1919) has been running for 126 hr. per week. When a new piston rod and rings were fitted in 1931 the wear on the cylinder walls was only 0.005 in., and the original main bearings are still in use.



In the foreground is a 75-h.p. engine driving a 50-kW generator, and at the back, a 40-b.h.p. engine with a 25-kW generator

The average electrical load is 38 kW, and the kWh generated 137,000 per annum. The boiler steam pressure is 110 lb. per sq. in., and the cost of raising steam is 20d. per 1,000 lb. The exhaust pressure is 18 lb. per sq. in. Taking the difference of heat units into account and with due allowance for interest, depreciation, oil, repairs, wages, and insurance, the overall cost works out at £150 per annum, thus saving approximately £270 over the cost of purchasing energy at 0.75d. per kWh. This is said to provide margin enough to cover the cost of the set in two years. A smaller and older unit of the same make is used as stand-by.

An Automatic Pumping Plant

The design and working costs of a Diesel-electric installation at Wirksworth

THE first fully automatic Diesel-electric vertical spindle borehole pumping plant in connection with a public water supply undertaking was recently installed for the Wirksworth Urban District Council, Derbyshire, under the direction of the surveyor and water engineer, Mr. A. E. Parry.

Since maintenance and human supervision had to be reduced to one visit per week, not only has the plant to start and stop automatically, but protection is essential. These conditions are met by the "Austinlite" system of control and were specified in the main contract placed with the Harland Engineering Co., Ltd., the manufacturers of the borehole pumping plant. Austinlite, Ltd., as sub-contractors, carried out all the electrical and automatic features of the plant.

Approximately 4,000 gal. of water per hour is lifted from the 201-ft. deep and 14-in. wide borehole, and delivered to a reservoir 2,650 yd. distant at a height of 400 ft. above the top borehole level. Four hydrant switches are provided along the pipeline between the pumping station and the reservoir. It is possible to start the plant for fire service by operating any one of these switches connected with the pilot line, irrespective of the position of the float switch in the reservoir.

The "Spiroglide" vertical spindle borehole pump is driven through a gear box and Broadbent centrifugal coupling by a four-cylinder Norris, Henty and Gardners 38-h.p. continuously rated crude oil engine. Mounted on the same bed-plate as the engine is a Crompton-Parkinson combined starter motor and generator. A 24-V Britannia starter battery is employed to crank the engine through the starter motor, which is directly coupled to the engine.

Method of Operation

The automatic operation panel has been balanced with the water flow, head and other recording instrument panels, for enhanced appearance. On the control panel can be seen the main starting contactor, ammeter, voltmeter, selector switch for automatic or manual operation, together with relays for starting or stopping the plant under the various protective devices.

The plant will start automatically when the float switch at the reservoir reaches the lower water level marks; if any one of the switches at four hydrants in the pipeline is operated; or should a thermostat indicate that the temperature of the circulating water in the engine cooling system approaches freezing conditions at 35 deg. F. A two-core cable is used as the pilot line between the float and the pumping station.

With the engine stationary a patented feature comprising a combined fuel and decompressor solenoid ensures that the fuel governor is held in the fuel cut-off position, and the cylinders are in a decompressed state. Associated with this solenoid is a centrifugal switch having high and low speed contacts.

The starting procedure is the same in all cases of demand under the conditions outlined above. Appropriate relays cause the main contactor to be placed in by the energisation of its coil. This connects the starter battery directly across the starter motor, and the engine begins to run. When a cranking speed of 120 r.p.m. is reached the low-speed contact on the centrifugal switch opens, operating through a relay, and energising the decompressor solenoid to permit immediate fuel injection, together with full compression. This results in immediate ignition. The engine quickly attains normal running speed. The centrifugal clutch forming the coupling between engine and pump has been carefully designed to engage the pump load when the engine attains approximately 75 per cent. of the normal engine speed.

With the engine running at a normal speed the battery is charged at the usual rate by means of the starter motor, which then functions as a generator. When a predetermined maximum battery voltage is reached a master voltage relay cuts the field resistance into the shunt field, thus reducing the charge rate to prevent unintentional overcharging. For intentional overcharging this thermal relay can be made inoperative.

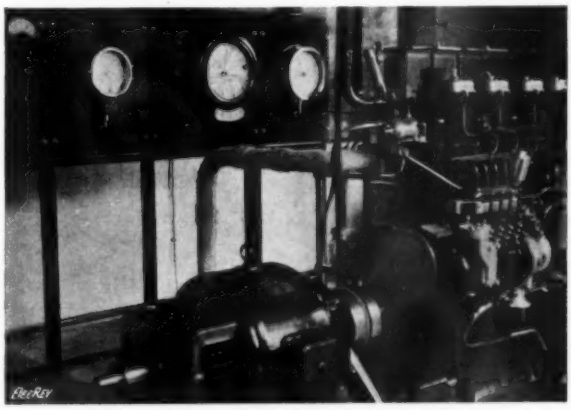
The battery is prevented from becoming completely exhausted in the event of the engine failing to start, due to lack of fuel or for any other reasons. This is achieved by arranging a thermal relay contact to open-circuit the main contactor coil, thus decompressing and stopping the engine if it fails to attain normal speed in 45 sec. Incidentally, the same protection is afforded in the event of the engine running out of fuel, or should the engine speed fall below normal for any reason, for example, irregular firing.

The plant is always stopped by automatically decompressing the engine cylinders and cutting off the fuel supply by placing the main contactors in the "off" position. The various protective devices differ only in the method of achieving this. Should the cooling water system reach 200 deg. F. a thermostat stops the engine, while a pressure relay acts similarly in the event of failure in the lubricating system. Electrically and hydraulically interlocked relays will also stop the plant should the pump fail to raise water, or should the filtered water to the pump spindles fail.

Costs Compared

The following comparisons of running costs between three types of plant are interesting:—With fuel oil at 5½d. and lubricating oil at 2s. 8d. a gallon, the actual fuel and lubricating costs of a manual Diesel, as determined by a 5½ hr. test, total 1.732d. per 1,000 gal. of water delivered. To this must be added attendance at 10s. per day of eight hours, or 3.769d. per 1,000 gallons based on the test figures. For repairs and oddments 1d. per hour, which equals 0.251d. per 1,000 gal., is reasonable. Therefore, the total cost per 1,000 gal. of water delivered is 5.752d.

An automatic electric motor of 23 b.h.p. requires 17.888 kWh per hour, and assuming electricity to cost 1d. per kWh, the cost per 1,000 gal. of water delivered is 4.472d. Lubricating oil and maintenance are small enough to be ignored; and attendance need be only for one hour per day, which would



The automatic operation panel

equal 0.525d. per hour or 0.156d. per 1,000 gal. of water. Therefore, the total cost per 1,000 gal. of water delivered is 4.628d. In Wirksworth, however, the cost when using electricity would be 13.572d. per 1,000 gal. of water delivered as, when the scheme was started, energy could not be obtained at less than 3d. per kWh.

With an automatic Diesel-electric engine expenditure on maintenance has been estimated at £11 7s. 3d. for 1,500 hr., or 10d. for 5½ hours. This represents 0.457d. per 1,000 gal. Fuel and repairs will be the same as with the manual Diesel. Therefore, the total cost per 1,000 gal. of water delivered is 2.44d.

A New Name for the Mercury Rectifier

THE Brown Boveri Co., of Baden, Switzerland, has recently issued an interesting notice regarding the designation of mercury rectifiers which states that when it became possible to utilise this apparatus for the conversion of d.c. into a.c. with the help of controlled grids the old designation was no longer a suitable one and others appeared, such as "invertor." The possibility of using the same apparatus for changing three-phase into single-phase current of another frequency suggested other names, such as "static convertor," while general names used to describe apparatus performing different kinds of conversion have included the words "valve" and "thyratron."

In Germany the terms "Stromrichter," "Gleichrichter," "Wechselrichter," and "Umrichter" came into general use, but experience has proved that all these designations are constantly being confused, since none of them is directly translatable into other languages. This is due to the fact that the terms do not, in themselves, convey any meaning of the design and working process of the apparatus.

The grid-controlled rectifier can be used for almost any kind of conversion but there is no reason why it should be given different names according to the kind of conversion it performs. Messrs. Brown Boveri have coined the words "mutator" (English and German), "mutateur" (French), and "mutatore" (Italian) from the Latin *mutare* (to alter, transform, change). It will be necessary to give the full designation (such as "d.c.-a.c. mutator") only at the beginning of an article or publication and in the subsequent course of the text to refer to the "mutator" only, as is done when describing transformers, motors, generators, &c.

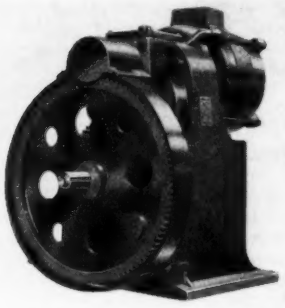
D

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Low-speed Drives

Internal modifications in the gear box of "Neco" telemotors, which were originally introduced for the remote control of large ventilating dampers, have been made to give a greater speed reduction than that hitherto obtainable, thus increasing the range of industrial application of these machines. A final speed is now available of 0.36 r.p.m. for a motor speed of 700 r.p.m. and 0.70 for a motor speed of 1,400 r.p.m.



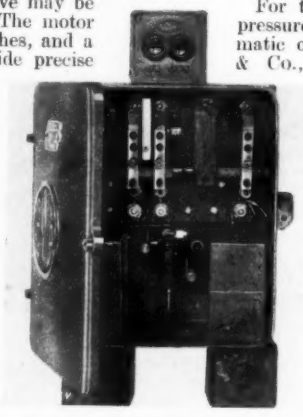
The "Neco" telemotor

The motor is spigot-mounted on a triple or quadruple-reduction oil-immersed gear box that provides some convenient speed between 5 and 25 r.p.m. This unit is mounted on a cast-iron base and drives the final shaft, which runs on ball bearings in the base, through a pair of guarded external spur gears, designed to transmit torques up to 200 lb.-ft., in either direction.

The machine can be provided with a crank pin on the large external gear or, alternatively, with a shaft brought out at either or both ends in order that the final drive may be arranged to suit the requirements of users. The motor can be arranged for reversing and limit switches, and a magnetic brake can be readily fitted to provide precise control. The machine is made throughout by the NORMAND ELECTRICAL CO., LTD., at its works at 3, North Side, Clapham Common, S.W.4.

Capacitor Motors

The "Empress" capacitor-start motor is essentially a standard protected 200 to 250-V single-phase machine with a short-time rated dry electrolytic capacitor connected in series with the auxiliary winding through a pair of slip rings in the inside cap of the back-end bearing. When the motor is at rest these rings are short-circuited by a carbon brush under tension. The initial two-phase field results in a minimum torque of 100 per cent. of full-load torque with no more than three times full-load current. As the motor accelerates the spring-loaded brush arm flies out and breaks the secondary circuit, the motor then running as an ordinary single-phase inductor unit.

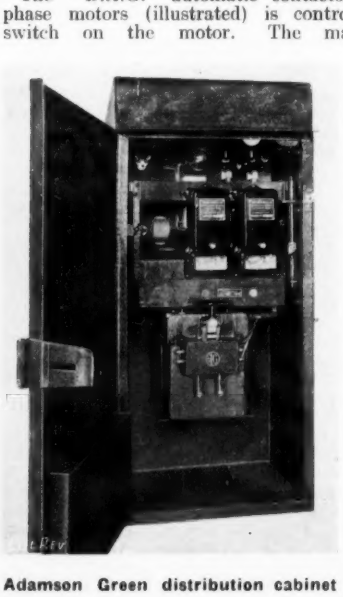


The "BAG" automatic contactor for cage-type single-phase motors

Where exact overload protection or push-button control is required contactors are provided with two sets of centrifugal clappers, one for controlling the main circuit and the other the auxiliary circuit. One type of motor (up to 3 h.p.) is suitable for infrequent starting only; the other is designed for frequent starting and arduous duty in sizes up to 7½ h.p.

The "B.A.G." automatic contactor for cage-type single-phase motors (illustrated) is controlled by a centrifugal switch on the motor. The manufacturers are now supplying contactors with current limitations where the starting current does not exceed twice full load, and also three-button contactor panels similarly housed for operating single-phase motors for lifts and hoists.

The manufacturers are BROOK MOTORS, LTD., Empress Works, Huddersfield.



Adamson Green distribution cabinet

Pole-mounted Control Unit

The l.v. distribution cabinet made by MESSRS. ADAMSON, GREEN & CO., LTD., St. Bede's Electrical Works, Felling-on-Tyne, is intended primarily for the control and protection of rural networks. It includes (mounted on a "Sindanyo" panel) a d.p. air-break isolator, an oil switch with loose handle, and two overload trip coils, 5-A current transformers (with wound primaries) connected in the trip circuit and employed also for load indication, neutral earth-testing coil for use in connection with "Tong-test" ammeters, and lamp for preventing condensation. Overload protection combining relatively long inverse-time characteristics with instantaneous operation under heavy fault conditions (similar to that provided by an oil switch with time-limit fuses) is obtained by the use of Poynder load indicators and thermal trip devices, which were described in our issue of September 22nd, 1933.

The cabinet is dispatched to site completely assembled for bolting to the pole of a pole-mounted sub-station. Its dimensions are 3 ft. 6 in. high by 1 ft. 7 in. wide by 1 ft. 2¼ in. deep.

The salient features of the system are: (1) absence of fuses; (2) the provision of discriminating protection against overload and l.v. network faults on the l.v. side of the transformer; (3) avoidance of interruptions of supply due to short-time current rushes (*e.g.*, on starting motors); and (4) measurement of thermal load, taking into account the ambient temperature, thus enabling full use to be made of existing plant.

Wormgear Modifications

We understand from MESSRS. H. WALLWORK & CO., LTD., Red Bank, Manchester, that the "K" type wormgear made by this company has undergone various modifications. The working centres have been decreased while the ball and roller bearing sizes have been increased: a stiffer casing is used and duplex thrust bearings on both shafts are now included, while all projecting shafts are oil-sealed.

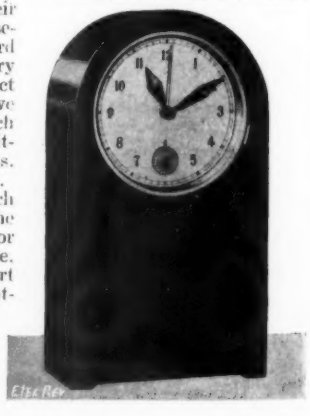
Electrode Steam Raisers

For the production of small quantities of steam at pressures up to 25 lb. per sq. in. where completely automatic operation is not essential, Messrs. A. REYROLLE & CO., LTD., Hebburn-on-Tyne, have developed a metal-clad 3½-gal. steam raiser with totally enclosed connectors. This can be fitted with three-phase electrodes giving a single fixed loading of 10, 15, 20 or 35 kW (at pressures up to 650-V). The loading selected depends upon the rapidity with which all the water is converted into steam, the standard periods with the loadings given being 50, 35, 30 and 20 minutes. The steam period can be prolonged indefinitely by feeding water through a hand pump. No current flows when the electrodes are fully uncovered through the water boiling away.

Where automatic load-control is required three-phase electrode steam-raisers are available for 650 V or less with a maximum rating of 1,000-kW. The standard model is designed to produce steam at a pressure of 60 lb. per sq. in. within three minutes of switching on. Automatic regulation is provided from full load down to 10 per cent. of full load and within ±5 per cent. of the selected value. All the live conductors are entirely enclosed in metal casings which are earthed. For ratings up to 250-kW the apparatus is entirely self-contained and is delivered completely assembled, a single welded framework carrying the boiler, a motor-driven feed pump, load-selector relay and control panel.

Combined Clock and Time Switch

Although MESSRS. WM. SANDERS & CO., Falcon Electrical Works, Wednesbury, have no intention of undertaking the general manufacture of synchronous electric clocks, they have recently placed on the market a combined synchronous clock and time switch known as the "Sandy," since time switches are closely allied to their speciality—switch- and fuse-gear. It has the outward appearance of an ordinary clock, and so will not detract from any general decorative scheme, while the time-switch portion is particularly suitable for domestic operations. It can be loaded up to 3 kW.



"Sandy" clock and time switch

Some of the time-switch uses recommended by the makers are switching on or off at pre-set times a kettle, radiator, radio set, "start work" syren, and shop lighting. Definite line, neutral and earth connections are easily accessible on withdrawal of the mechanism, for both the supply and apparatus circuits.

There are a start knob for the clock and a dial and pointer for setting the switch, while an inspection hole at the back reveals the "on" or "off" setting of the switch. The driving unit is common to the clock proper and the time switch.

In the Courts

AN unusual case came forward on Saturday last at the Lancaster Assizes when the Morecambe and Heysham Corporation sued Mr. Samuel Frith, a tar macadam manufacturer, for £538 in respect of electricity supplied, or damages for breach of contract.

It was stated for the Corporation that in August, 1929, the defendant installed a large motor in his works which necessitated the provision of a larger meter which registered in tens of units. The Corporation meter reader did not appreciate that the meter had been changed and read the tens as units. Consequently the defendant was charged only one-tenth of the proper amount for over three years, the difference amounting to the sum claimed, and he had declined to pay the balance.

Counsel for Mr. Frith said that the facts as stated were admitted, but he maintained that the Corporation was estopped from recovering on the ground that the accounts tendered quarterly were considered to be correct and were paid. Moreover, before the mistake was discovered the defendant had entered into contracts based on the charges previously made, and if he were called upon to pay the whole amount his business might be crippled.

Mr. Justice Porter said that it was evident that there had been a mutual mistake but that did not prevent the Corporation claiming the amount which was properly due. He did not accept the view that Mr. Frith's position would be prejudiced.

Counsel for the Corporation said that they did not wish to be hard on the defendant and would not claim costs. Judgment was accordingly entered for the Corporation for the amount claimed, without costs.

Dynamos for London Buses

Mr. R. S. C. Bosanquet, the Official Referee, last week concluded the hearing of the action brought by the Highfield Electrical Co., Ltd., against Mr. A. J. Salisbury, claiming £291, the balance due for twenty-seven dynamos and regulators supplied to the London Passenger Transport Board (see our last issue, p. 133).

On January 23rd, Mr. F. W. Highfield, the plaintiffs' managing director, gave evidence. He said that he worked to the specification provided by Mr. Salisbury and after overcoming various difficulties produced a dynamo and regulator which satisfied him. He submitted them to Mr. Salisbury, who gave him an order for twenty-five. He understood that the Transport Board was satisfied with everything except the voltage rise. Each machine was tested and found to comply with the specification. He had remedied certain faults in work and material to which his attention had been drawn, but he asserted that there was nothing wrong with the machines.

After Mr. Highfield had been cross-examined, Mr. J. Ayres, his assistant, gave evidence, and then Mr. Salisbury was recalled. Evidence was also given by Major G. McAlpine, M.I.E.E.

At the close of the evidence the Official Referee said that as then advised, the defendant, Mr. Salisbury, had not satisfied him that the cause of the failure was the excessive field current.

Mr. Cartwright Sharp, on behalf of the plaintiffs, submitted that the questions to be decided were what the contract between the parties was and whether the defendant relied on Mr. Highfield's skill and judgment. He contended that the contract was that Mr. Highfield was to produce a dynamo and other gear and when submitted and approved make the machines according to the one approved. That contract plaintiffs had carried out.

It was decided that the following questions or some of them should be left to the Official Referee:—(1) Were the goods of a description which it was in the course of the plaintiffs' business to supply? (2) Did the defendant show that he relied on Mr. Highfield's skill and judgment? (3) Were the goods fit for the purpose? (4) Were the plaintiffs under an obligation under the contract to supply machines fit for the order of the L.P.T.B.? (5) Were the machines supplied by the plaintiffs fit for that order? (6) Did the L.P.T.B. accept or reject the machines? (7) Were the goods supplied in any and what material respect not in compliance with the contract? (8) Damages due to defendant on the counterclaim if any.

Mr. Roland Burrows then replied on behalf of Mr. Salisbury on his counterclaim to be entitled to damages and at the conclusion of his address and Mr. Blain's reply for the plaintiffs the Official Referee reserved judgment.

Mullard v. Philco

The hearing of the appeal of the Mullard Radio Valve Co., Ltd., from the judgment of Mr. Justice Farwell in an action brought by the company against the Philco Radio and Television Corporation of Great Britain, Ltd., for the alleged infringement of a patent, was concluded by the Court of Appeal on Monday last when the Court reserved judgment.

Factories Act Prosecution

Following an accident to a boy employé, Dennis Sherwood, Chertsey, in which he had the tops of two fingers severed by a metal-cutting guillotine, the Hackbridge Electrical Construction Co., Ltd., Hersham, was fined £5 with 7s. 6d. costs at the Kingston-on-Thames Police Court on January 21st under the Factories Act for failing to have dangerous machinery effectively fenced.

New Books

Theory of Alternating-Current Wave-Forms. By P. KEMP. Pp. 218; figs. 73. London: Chapman & Hall, Ltd. Price: 15s. net.

"The advances made within the realm of electrical engineering during the twentieth century have been phenomenal." This opening sentence from the preface of this book reminds us how truly wonderful are the achievements which to-day we are inclined to take for granted without stopping to pay tribute to the enthusiasm, energy and mental capacity of the many investigators engaged in electrical and allied research, and in the boldly conceived industrial applications of the results in ways undreamed of a decade ago.

Whatever new discoveries may be made, in principles or in applications, the basic tools of fundamental knowledge will remain the first desiderata, and the book under review constitutes such an implement. Much has been written in the past on a.c. wave-forms, but we believe this is the first volume to deal exclusively and comprehensively with the subject. The book is the first of a series of monographs to be published on electrical engineering, and the preliminary list of subject titles makes an imposing array of quality. Editorship of the series is in the capable hands of Mr. H. P. Young, M.I.E.E., of the Regent Street Polytechnic, at which the author of the present work is the head of the School of Engineering.

The book presents the facts relating to non-sinusoidal waves in a general manner without reference to specific machines or types of apparatus, but it is hoped to include the latter in a later volume. A general knowledge of a.c. theory is assumed, and the mathematics involved is of quite a simple character. The scope covered may be indicated quite adequately by the chapter headings, which are properties of complex waves, effect of iron, effect of other circuit conditions (cyclically variable resistance, resistance with negative-temperature co-efficient, arc circuits, pulsating reactance and capacitance), harmonics in polyphase systems, and, finally, harmonic analysis.

The treatment is confined strictly to the title of the book, and its value will be enhanced considerably by the addition of the complementary volume already referred to, especially if this includes studies of power transmission and communication circuits. If the high standard set by this volume is maintained by the succeeding ones of the series, electrical engineering literature will be benefited to a very considerable extent. The production of the book exhibits delightful craftsmanship, and the price is quite reasonable.

The Electrical Encyclopædia. Pp. 1,480: figs. 2,300. London: Waverley Book Co., Ltd. 4 vols. Price 70s.

The general editor of this encyclopædia, Mr. S. G. B. Stubbs, has defined it as "a comprehensive work designed for the use of the working electrician," but this term must be regarded as including everyone in our industry, irrespective of his grade or section. It is the first of its kind. While it is not in any sense of the word a popular handbook to electricity, it must be differentiated from the more strictly scientific kind of encyclopædia. Nevertheless, the method of treatment adopted in the main articles is certainly not a superficial one.

Practical knowledge of almost any of the applications of electricity cannot to-day be divorced from theory. Among the many good examples of the way in which electrical theory has been presented are Mr. S. A. Stigant's article on transformers in modern practice and, on a still wider subject, Sir Oliver Lodge's articles on potentials and, in collaboration with Mr. J. H. T. Roberts, on the modern theory of the electron.

The editor has picked his team of contributors very carefully and the standing and qualifications of the contributors stand as authority for the work. The six associate editors are Messrs. Arthur Arnold, R. A. Baynton, Philip Kemp, S. O. Pearson, S. A. Stigant and G. W. Stubbings, and among the other writers are many contributors to this journal. Several articles relating to wiring systems, building regulations, conduit and wiring accessories have been written by Mr. D. Smeaton Munro, who has performed the difficult task of pronouncing "encyclopædically" on the many controversial aspects of this subject with impartiality and insight.

In an admirable introduction the editor refers to the value of the encyclopædic method of presenting a subject in that it provides equally for quick reference (owing to its alphabetical arrangement) and for a course of reading by means of cross references. For either purpose this work is excellent. The cross-reference system has been carefully devised and checked; the articles dealt with in this way are either printed with capitals or else the cross reference is made in a manner which does not interrupt the text and is unambiguous. The use of the encyclopædia has been still further simplified by the inclusion in the last volume of a series of classified headings

under which the reader will find all the related articles on one subject or group gathered together in alphabetical order.

Information and definitions have been repeated in various sections to avoid forcing the reader to scramble from volume to volume too frequently. The encyclopædia should appeal to all, men or women, with an interest in technology. Architects, in particular, would be well advised to get it. The volumes are extremely well produced and the theory and well-chosen diagrams and half-tone illustrations.

* * *

Shorter Notices

"Photoelectric Cell Applications" (Second Edition), by R. C. Walker and T. M. C. Lance. Pp. 245; figs. 142. Price 8s. 6d. "The Superheterodyne Receiver," by A. T. Witts. Pp. 128; figs. 75. Price 3s. 6d. London: Sir Isaac Pitman & Sons, Ltd.

Some of the most important of the new sections in the *Practical Electrician's Pocket Book*, 1935 (Odhams, 2s. 6d.), are evidence of the rapid changes in the electrical industry. Noise measurement appears for the first time, a complete new chapter on traffic signalling is introduced, the wiring notes are based on the 10th Edition of the I.E.E. Regulations, and trolley buses are discussed in the chapter on tramways. Complete revision has been made of a number of sections and Mr. A. P. M. Fleming has contributed an article on electrical progress in 1934.

"Electrical Engineering Testing" (Fourth Edition), by G. D. A. Parr. Pp. 691; figs. 296. London: Chapman & Hall. Price 8s. 6d.

"Electrical Engineering—Vol. II, Alternating Currents" (Third Edition), by C. L. Dawes. London: McGraw Hill Publishing Co. Price 24s.

Electrical Exports of the United Kingdom

Principal destinations in 1933

THE annual statement of the export trade of the United Kingdom for 1933 has recently been published by the Stationery Office (17s. 6d. net). It gives under a much more detailed classification than the monthly accounts the countries of destination of the goods shipped abroad. From this statement we have extracted the following figures showing the values of the principal groups of electrical goods and apparatus and machinery exported in 1933, increases or decreases compared with 1932 being added.

With regard to goods and apparatus it will be noticed that there was a total rise in value of £912,000, with particularly noteworthy increases in the cable, radio, and telegraph and telephone groups. Electrical machinery, as a whole, showed a decline between 1932 and 1933 of over 50 per cent. the falling off being very noticeable in starting and controlling gear, switchgear, static transformers and unspecified machinery. In all groups the British Empire stands out as a leading customer, with South Africa showing increases almost throughout.

GOODS AND APPARATUS.

	1933. £ (Thous.).	Inc. or dec. on 1932. £ (Thous.).
Wires and cables, rubber ins lated (not telegraph or telephone)—		
Total	700	+ 78
To India	168	+ 19
,, South Africa	162	+ 78
,, Australia	149	+ 8
,, New Zealand	33	—
,, Irish Free State	15	— 9
,, Argentina	12	+ 4
,, China...	20	— 5
,, Straits Settlements	13	— 10
Wires and cables, insulation other than rubber (not telegraph or telephone)—		
Total	522	+ 48
To India	125	— 7
,, South Africa	153	+ 76
,, Australia	89	— 3
,, New Zealand	10	— 15
,, Straits Settlements	15	— 2
,, Port. E. Africa	23	— 12
,, Argentina	9	— 6
,, China...	16	+ 5
Telegraph and telephone wires and cables (not submarine)—		
Total	264	+ 41
To South Africa	62	+ 33
,, India	21	+ 2
,, Australia	29	— 5
,, New Zealand	14	— 5
,, China...	18	+ 12
,, Mexico	23	+ 22
,, Rumania	13	— 9
,, Egypt	12	+ 11
Submarine telegraph and telephone cables—		
Total	129	— 2
To Canada	8	+ 8
,, Denmark	48	+ 20
,, France	37	— 29
,, Spain	11	—
Radio receiving sets (other than radio gramophones) excl. valves—		
Total	241	+ 82
To Irish Free State	51	+ 21
,, South Africa	14	— 10
,, India	7	+ 2
,, New Zealand	11	+ 6
,, Netherlands...	34	+ 10
,, Belgium	28	+ 15
Transmitting apparatus (excl. valves)—		
Total	264	+ 21
To Irish Free State	—	— 17
,, South Africa	11	+ 9
,, India	2	— 12
,, Colombia	11	+ 9
,, Rumania	83	+ 72
,, Italy	23	— 13
,, China...	27	+ 26
Wireless valves—		
Total	354	— 6
To Irish Free State	33	+ 11
,, South Africa	13	+ 5
,, India	12	—
,, Australia	26	+ 2
,, New Zealand	7	— 1
,, Sweden	22	+ 10
,, Belgium	28	— 24
,, France	42	— 37
Other wireless parts and accessories—		
Total	397	+ 15
To Irish Free State	33	+ 8
,, South Africa	16	+ 2
,, India	22	— 6
,, Australia	11	—
,, New Zealand	25	+ 7
To Holland	64	+ 13
,, Belgium	23	— 2
Other telegraph and telephone apparatus—		
Total	1,074	+ 404
To South Africa	218	+ 66
,, India	54	+ 16
,, Hong Kong	41	+ 33
,, Australia	56	+ 35
,, British West Indies	22	+ 17
,, Poland	129	+ 89
,, Portugal	70	+ 57
,, Italy	40	+ 6
,, Egypt	45	+ 36
,, Brazil	38	+ 31
,, Uruguay	34	+ 33
Lamps, 20-V and over, gasfilled—		
Total	254	+ 56
To Irish Free State	24	— 3
,, South Africa	45	+ 8
,, India	40	+ 3
,, Australia	32	+ 21
,, New Zealand	38	+ 11
,, Argentina	18	+ 6
Lamps, 20-V and over, other—		
Total	143	— 8
To South Africa	31	+ 4
,, India	26	— 1
,, Australia	15	—
,, New Zealand	25	— 8
Batteries, primary, for flash lamps—		
Total	42	+ 10
Other primary batteries—		
Total	164	+ 17
To Irish Free State	23	+ 6
,, South Africa	25	+ 8
,, India	19	— 2
,, New Zealand	13	— 5
Accumulators, portable and parts—		
Total	250	— 36
To Irish Free State	20	—
,, South Africa	15	—
,, India	58	— 4
,, Denmark	21	— 5
Accumulators, stationary—		
Total	267	+ 90
To India	48	+ 9
,, Hong Kong	53	+ 53
,, Holland	12	— 5
,, Greece	17	+ 12
Cooking and heating apparatus—		
Total	137	+ 21
To South Africa	55	+ 11
Ammeters, voltmeters, etc.—		
Total	91	— 16
To India	22	— 1
,, Australia	14	+ 7
House service meters—		
Total	108	+ 2
To South Africa	16	+ 2
,, India	31	+ 9
Total of electrical goods and apparatus (incl. unspecified)—		
Total	6,697	+ 912
To Irish Free State	320	— 10
,, South Africa	1,034	+ 351
,, India	869	— 30
,, Australia	557	+ 102
,, New Zealand	297	— 26
,, Hong Kong	163	+ 89
,, Denmark	217	+ 68
,, Holland	178	+ 3
,, Belgium	146	— 5
,, France	196	— 98
,, Switzerland	63	+ 4
,, Italy	167	—
,, Argentina	32	+ 9
To Poland	147	+ 81
,, Portugal	136	+ 76
,, Rumania	128	+ 65
,, Egypt	142	+ 65
,, China...	159	+ 64

MACHINERY.

	1933. £ (Thous.).	Inc. or dec. on 1932. £ (Thous.).
Generators above 200 kW.—		
Total	338	+ 64
To South Africa	77	+ 61
,, India	42	+ 18
,, Australia	37	+ 1
,, Canada	18	+ 14
,, Soviet Union	66	— 39
,, Denmark	36	+ 36
,, China...	4	— 23
Generators not above 200 kW.—		
Total	173	+ 9
To South Africa	11	+ 4
,, India	37	— 5
,, Australia	12	+ 1
,, Iraq	12	+ 9
Motors, railway and tramway—		
Total	44	— 20
To India	6	+ 6
,, Brazil	9	+ 5
,, Uruguay	14	— 14
Motors, other, above 250 h.p.—		
Total	254	+ 8
To South Africa	51	+ 19
,, India	11	— 1
,, Australia	14	+ 6
,, Soviet Union	152	—
Motors, other, not above 250 h.p.—		
Total	497	+ 18
To South Africa	74	+ 23
,, India	80	+ 9
,, Australia	47	+ 19
,, New Zealand	21	— 5
,, Soviet Union	40	— 20
,, France	22	+ 10
,, China...	20	+ 1
Convertors and transformers, static—		
Total	248	— 211
To South Africa	77	— 41
,, India	64	+ 14
,, Palestine	14	+ 13
,, Egypt	9	— 1
,, China...	8	— 10
Starting and controlling gear for motors—		
Total	254	— 293
To South Africa	37	+ 4
,, India	37	— 93
,, New Zealand	35	+ 28
,, Soviet Union	41	— 111
,, France	15	— 25
,, China...	13	+ 1
Switchgear—		
Total	635	— 78
To South Africa	213	+ 6
,, India	159	— 107
,, Australia	43	+ 33
,, Soviet Union	21	— 29
,, Egypt	19	+ 5
,, China...	19	+ 2
,, Argentina	20	+ 4
Elec. machinery, not elsewhere specified—		
Total	141	— 481
To South Africa	7	— 31
,, India	19	— 117
,, Australia	6	— 9
,, New Zealand	2	— 10
,, Soviet Union	1	— 141
,, Sweden	9	— 8
,, France	18	— 6
,, Switzerland	12	— 2

The Electrical Contractors' Dinner

THE Electrical Contractors' Association entertained a large number of distinguished guests, representative of the electrical and allied industries, Government Departments, &c., at its annual dinner at the Savoy Hotel, London, on Tuesday, under the presidency of Mr. Howard Marryat. The president had had prepared for each guest a folder containing facsimile reproductions of three Faraday letters which he has in his possession, as well as notes on Faraday's Bible, which he also has.

Following the loyal toast, Sir Archibald Page (Chairman of the Central Electricity Board) proposed "The Allied Associations and Honorary Officials." Having complimented the Association on its good fortune in having Mr. Marryat as its leader at a time when leadership, statesmanship and goodwill counted for so much in the proper conduct of the affairs of the Association, Sir Archibald went on to speak of the great importance of electricity as an agency in the rehabilitation of our industrial activity and the development of our social structure; but he added that it might be somewhat embarrassing for an industry to be the darling of the gods. There was no shirking of its responsibilities as an industry to determine within itself a rapid forward movement on sound and sane lines; the industry must speak and act in all its branches as a united force, bent on placing and keeping Great Britain where it ought to be, in the forefront of electrical attainment.

The old order of things in industry generally was passing, its place being taken by something with a great deal more public spirit and less self. It meant a certain amount of sacrifice of freedom and breaking of tradition here and there, but co-operation was the keynote. The market had no limitations. The 14 per cent. increase in the number of units sold, recorded last year, represented very good going; but he suggested that this figure be accepted rather as a measure of the potentialities and a challenge to do something still better this year.

He welcomed the action of the I.M.E.A. towards closer relations by organising the National Electrical Convention in June; it was of the very greatest significance because of the benefits which would accrue to the industry as a whole, not forgetting the all-important consumer, and, secondly, because the grid, both technically and financially, was an asset of which this country had every reason to be proud.

Fair Trading

The President, in his response, trespassed into a field which, he said, Sir Archibald had cleverly avoided—that of fair trading. He expressed his pride in the E.C.A. because of the outstanding loyalty of its membership in pursuing its high ideals, and said he felt it would be better for the cohesion of the whole industry if some of the other associations were constituted on similar lines. The E.C.A. had come into being at a time when the trade was threatened with extinction, when discounts were enormous, and anyone could buy anything at a net price if his money were good; and its main object was to reduce this chaos to some sort of order.

Was it not a striking thing, he asked, that the E.C.A. should have been struggling for over thirty years to secure reasonable trading conditions? Could the industry really congratulate itself upon this fact? For seven years it had been engaged continuously upon a committee composed of all sections of the industry in drafting a Fair Trading Policy. Over and over again its members had appeared to be in complete agreement, and as many times settlement had been postponed; and now, when all other parties were agreed, a fresh delay was caused by one association presenting a difficulty in the interests of municipal trading.

He hesitated to use the term "municipal trading." For seven years it had been shut in a box lest it should offend somebody; but the time had come to raise the lid and look the bogy straight in the face. The E.C.A.'s opposition to it was not entirely selfish. It saw no reason why the installation trade should be singled out for special attack, but, apart from that, it believed most sincerely that the backbone of this country was to be found in its dependence on individual enterprise.

Mr. Marryat spoke of the Association's fight against this bogy for twenty-five years, until in 1926 it was persuaded to lay aside its weapons and to effect what was thought to be a final settlement of its difficulties in the compromise clause, No. 48, of the Act of that year, and the understanding signed on behalf of the I.M.E.A., which went with it. Since then the E.C.A. had struggled to secure what was due under the compromise. Any casual observer might well say that no progress had been made. But progress, in a sense, had been made. The parties had come to know and appreciate one another better, and in many quarters there was a strong desire to see the matter settled. In the ordinary course of events, if we escaped political interference, this Fair Trading Policy would be consummated some day—perhaps within the lifetime of some of the younger men present at that assembly. But agreement might, and could, be reached now. All that was required was vision and courage—vision of the immense benefits agreement would bring to the industry, and courage to sacrifice some personal opinions in the interest of the general good.

Finally, Mr. Marryat reminded all men of real business experience in the industry that unless they put their house in order from within—to use Sir Andrew Duncan's words—they would find themselves involved in some political landslide that might place them in very strange company indeed. At the National Convention in Bournemouth the industry would certainly put up a bold front; but how great would be the difference if all sections were to go there really united and full of inspiration and confidence in the future in consequence of knowing that this wretched discord had been finally resolved!

The National Convention

Mr. W. Riggs proposed the health of the guests, and paid personal tributes to many of them. He referred particularly to Sir Archibald Page, and felt assured of every consideration from him in the times ahead. Sir John Brooke (vice-chairman of the Electricity Commission) was fully alive to the importance of a high standard of work. Whether or not the I.E.E. Wiring Rules would ever become compulsory he did not know, but the Commission was to be thanked for the first instalment of authoritative regulations, which instalment, it was hoped, would be followed by others. In a tribute to Mr. Hoadley (President of the I.M.E.A.), he referred to the forthcoming National Convention as providing a grand opportunity to cement existing friendly relations between all sections of the industry and to create new contacts and confidence where such were needed. Co-operation had been referred to by Sir Archibald as the keynote; and Mr. Riggs suggested that mutual confidence should be the watchword. Among the many other guests to whom Mr. Riggs paid personal tributes were Prof. W. M. Thornton (President, I.E.E.), and Sir William Ray (Executive Chairman, E.D.A.).

Sir John Brooke responded in an amusing and clever speech. He confessed that he had never understood the Association's title, for it seemed absurd to associate the words "electrical" and "contractors." Nothing in the electrical industry was contracting, except the prices to consumers. The members of the Association were electrical expanders, and so long as they continued to work, as at present, in co-operation and in reasonable harmony—which he hoped was growing—with the supply undertakings, each doing their proper job, they would make Sir Archibald Page's estimates "look silly." The contractors of this country had given the most reliable and by far the safest supply in the world. The public wanted a cheap supply of electricity, and did not mind who gave it to them; if we were so foolish as not to be able to agree with one another and to give it to them as quickly as they wanted it, they would turn to somebody else.

Sir William Ray, who also responded, in a characteristically witty speech, said that he had sufficient faith in the officers of the E.C.A., who were dealing with their problems in a perfectly reasonable manner, to believe that in due course something satisfactory to the whole industry would eventuate.

Mr. E. E. Hoadley (President, I.M.E.A.), made a further response to the toast. He said that for a long time he had held the view that if there were a real "get together" of all branches of the industry a great deal of good must come out of it. Some had worked very hard, and against a great deal of opposition, to this end, and he looked forward to very great results from the Convention. He appealed to all to approach it in the proper spirit; surely they could agree on a common policy which, whilst preserving their own individuality and their individuality as organisations, would redound to the great good of the electricity supply industry! Speaking of his relations with the electrical contractors at Maidstone, he said they were all absolutely satisfied. The contractors there secured all the work they could do with any profit to themselves, and the supply undertaking did all the work which necessitated losses in the immediate present, with a hope of greater gain in the future. Surely, along such lines, there must be a path which all in the industry could tread in the happiest relations.

The health of the chairman was proposed by Mr. A. G. Bruty, and was responded to by Mr. Marryat in his usual modest manner. An excellent entertainment contributed to the evening's enjoyment.

Business and Industrial Notes

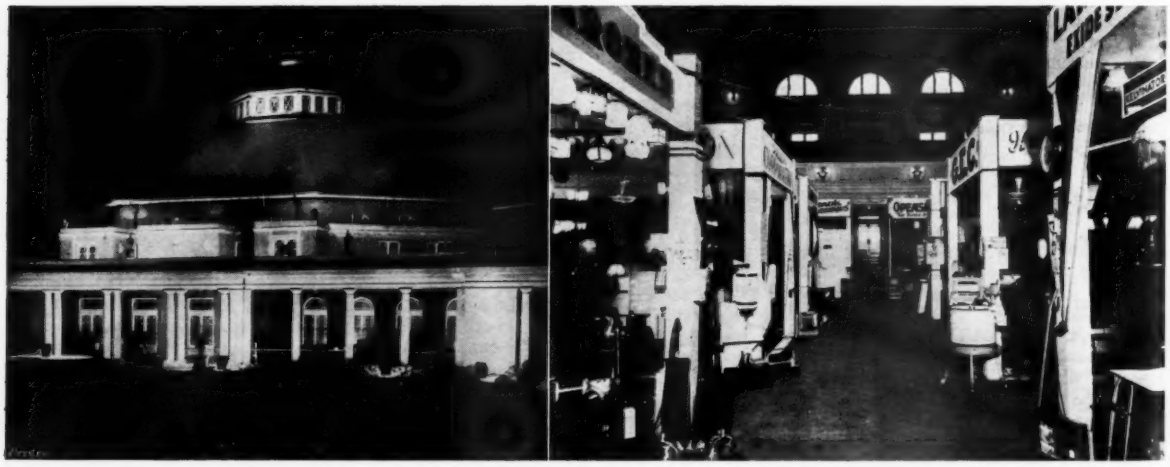
The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The "Electrical Review" Index

The index to Volume CXV (for the half-year ended December 31st, 1934) is now ready, and can be obtained (free of charge) on application to the publisher, ELECTRICAL REVIEW, Dorset House, Stamford Street, S.E.1.

An Electrical Exhibition at Douglas

The Douglas Corporation held a successful electrical exhibition from January 14th to 19th in the Villa Marina Ballroom, and Mr. Bertram Kelly, the borough electrical engineer and manager, is to be congratulated upon the result. The Douglas electricity undertaking not only supplies the capital of the island and surrounding villages, but also provides electricity in bulk to the Isle of Man Board which has been set up for distribution outside the 17 sq. mile area of the Douglas Corporation. The exhibitors, apart from the Corporation stand, included the General Electric Co., Ltd., the Jackson Electric Stove Co., Ltd., the Edison Swan Electric Co., Ltd., Ferranti, Ltd., and Santon Ltd., while it was supported by the members of the local E.D.A. Circle, including Messrs. Lawton & Co., Ltd., W. Mullin, Ltd., J. C. Fargher, Ltd., Seddon & Son, T. H. Lawton, A. McCall & Co., Openshaw & Co., Randle & Co., G. H. Cowley, Ltd., and T. Moore. In conjunction with the exhibition the E.D.A. films were shown and cooking demonstrations were given daily. The films were a great success and attracted packed houses, and it is significant that the queues were longer at the end of the week than at the beginning. Approximately 16,000 attended the exhibition. The opening ceremony was performed by the Mayor, Ald. J. H. Skillicorn. Ald. T. W. Cain, who presided, said the turnover of the electricity undertaking was now about £50,000 per annum. There was a capital debt of £359,000, of which £76,000 had been repaid, and in addition £9,000 had been spent out of profits for capital purposes. The number of consumers was now 4,157. During the run of the exhibition the gardens and the hall were floodlighted. Our pictures show the illuminated exterior and a general view of the exhibition.



The Villa Marina, Douglas, floodlighted during the recent electrical exhibition and a general view of some of the stands

The Lighting Service Bureau

Plans for the reconstruction of the Lighting Service Bureau, in London, are reaching an advanced stage. It is hoped to include many new demonstrations. The Home Lighting section is to be enlarged, and increased facilities are to be provided for exterior lighting. The Lighting Service Bureau of Scotland is also being drastically overhauled. Although it was transferred to new premises as recently as 1933, it has been considered necessary to revise the demonstrations in order that the electrical industry in Scotland may have the use of a centre of lighting development fully equipped with the most modern demonstrations available.

Inspection of Electrical Apparatus in Victoria

Under an Act passed in the last session of the Victorian Parliament the State Electricity Commission has appointed an Approvals Board which will have power to inspect all electrical apparatus before it is placed on the market. The functions of the Board will be to examine apparatus and materials, and, after considering the results of laboratory tests, to make recommendations to the Commission as to their safety or otherwise for commercial use. It will be illegal for anyone to sell apparatus on which the approval of the Commission is not indicated by official markings. The Commission will also shortly require all electrical contractors to be registered. The members of the Board are: Mr. D. Dunham (chairman) and Mr. D. H. Miller (deputy chairman), representing the Electricity Commission; Mr. S. G. Hall, representing electricity supply authorities; Mr. B. G. Firth (wholesale electrical traders); Mr. A. Stuart (manufacturers of electrical goods); Mr. W. Cumming (electrical contractors); Mr. W. H. Stock (fire underwriters); and Mr. A. W. Henderson (representing workers in the electrical trade).

Fylde Contractors' Dinner

Members of Fylde (Lancs) Branch of the Electrical Contractors' Association recently held their annual dinner and social. There was a gathering of over 200, over which Mr. P. J. Frampton presided, supported by Mr. R. Harrison-Watson (vice-president of the Electrical Contractors' Association), Mr. C. Furness (borough electrical engineer, Blackpool), Mr. T. H. Tweedale (Liverpool Cable Co.), Mr. J. H. Farthing (General Electric Co.), and others. Mr. C. Furness, proposing "The Electrical Contractors' Association," said it had been his ambition for many years to see the status of electrical contractors and wiremen raised. He thought that in the near future there would be compulsory registration of contractors, and only registered contractors would be recognised by supply undertakings. Co-operation between supply authorities and the Association was necessary. Mr. Harrison-Watson replied to the toast.

A "Met.-Vick" Mining Exhibition

Following their successful exhibitions of mining apparatus at various centres in the British Isles, the Metropolitan-Vickers Electrical Co., Ltd., opened an exhibition of electrical apparatus for collieries at Metro-Vick House, Glasgow, on January 29th. A complete range of electrical equipment, as installed from the coal face to the pit bottom, is being shown. This includes coal and rock drills; face and mothergate conveyors; flameproof gate-end control units and section switches; underground lighting equipments; power transformers; and main h.v. and l.v. flameproof draw-out switches. The Birtley Co. is showing a scale model of the coal preparation plant installed at the Wallsend and Hebburn Collieries, and the following companies are also contributing with exhibits:—Clephan Conveyors, Ltd.; C. Crofton & Co. (Engineers), Ltd.; Drysdale & Co., Ltd.; Davidson & Co., Ltd.; and Beckett & Anderson. Official visits were made to the exhibition by the local branches of the National Association of Colliery Managers, and the Association of Mining Electrical Engineers. To attract attention to the exhibition the company has arranged a display of mining equipment in one of its show windows. This is similar to the display which recently appeared in the window at Crown House, Aldwych, W.C., an illustration of which was published in our issue of October 26th last, page 580.

An Inexpensive All-electric Showroom Bungalow

To provide an additional attraction during the normally dull months of January and February Mr. W. P. Johnston, engineer and manager, St. Helens Corporation Electricity Department, and his staff, conceived the idea of showing an all-electric bungalow. To do this a plywood structure has been built into the existing lecture room at the undertaking's showrooms in Bridge Street, at very little cost for the actual structural work, with an appearance of permanency. The seven rooms are all tastefully decorated and furnished. There are three bedrooms, a drawing room, a dining room, a bathroom and a kitchen. The last-mentioned compartment has a sink with hot and cold water supply equipment, incorporating a five-gallon "Can-

vary" water heater supplied by Berry's Electric, Ltd. The undertaking normally hires out a "Magnet" cooker, supplied by the General Electric Co., Ltd., complete with a "Simplex" control unit, and a three-pint kettle, and such an outfit is part of the equipment of the kitchen. There are also a "Magnet" wash-boiler and a washing machine of the same make. Other kitchen equipment includes a refrigerator supplied by Electrolux, Ltd., a flush panel fire and a flush mounted synchronous clock. In the bathroom is a "Canvary" water heater, a Ferranti wall fire with a pull-cord adjustable reflector, a G.E.C. towel drier, and two small totally enclosed spherical lighting fittings supplied by Messrs. Falk, Stadelmann & Co., Ltd.—a ceiling unit and a wall bracket over the mirror. The outstanding feature common to all the other rooms is the tasteful blending of the electrical equipment with the general colour scheme. A particularly interesting feature of the largest bedroom is that the general colour scheme of green and gold and the furniture were all supplied to "fit" with the Berry's dark and light green fire suite. An attractive lighting unit in this room is a bed-table fitting with twin cylinders surmounting a Doulton pot base. There are also "Poly-chrome" ceiling and dressing-table fittings. The number of visitors who have already responded to the advertising campaign has exceeded expectations. The Electricity Department has a two-part tariff with a rateable value fixed charge varying from 10 to 17½ per cent., and a running charge of ¼d. per kWh. On flat rates lighting costs 3½d. per kWh, and heating, cooking and domestic power supply is available at 0.9d. per kWh. Many of the appliances shown are hired out on attractive terms.

E.D.A. Luncheons

The annual luncheon of the South-West England and South Wales (Northern) Area of E.D.A. will be held at Cardiff on February 20th, and on the following day the annual luncheon of the South-West England and South Wales (Southern) Area will be held at Bristol.

Trade Announcement

Messrs. Holden & Brooke, Ltd., state that from to-day (Friday) Ideal Boilers & Radiators, Ltd., of Hull, is relinquishing the selling agency for their "Super-Selfix" circulators and "Senflux" non-return valves, and orders for these should in future be sent direct to Messrs. Holden & Brooke.

G.E.C. Batteries

The General Electric Co., Ltd., informs us that its recently extended battery works at Witton are working at full capacity on the production of the new "Marathon" h.t. radio batteries. Prices and discounts have been fixed and the company has produced a variety of "sales aids" for the trade, and advertising on a national scale has been arranged.

Mechanical Draught

Orders are in hand at the Belfast works of Messrs. Davidson & Co., Ltd., for a proportion of upwards of 120 mechanical draught and flue-dust collection plants. Among the power stations to be supplied are Hams Hall, Chatham Dockyard, Croydon, Carville (N.E.S. Co.), Poplar and Sheffield in this country, and Klip, Kroonstad and Witbank in South Africa. Other work under construction comprises heating and ventilating plant for industrial works, theatres and cinemas and the tunnel ventilation plant for the Galloway water-power scheme, the Post Office, and the London Passenger Transport Board.

Chilean Import Duties

Complying with requests from a local telephone undertaking which desires to install a new plant, the Chilean Chamber of Deputies recently approved a proposed law reducing the import duty on apparatus for telephone and telegraph services, not specified, from 7.50 gold pesos per legal kg. to 0.505 gold pesos per gross kg. The new law also adds that "complete distribution and control boards for electric plants or centrals" have been added to Item 1410 of the Chilean tariff, which now covers "transformers, rectifiers, resistances, rheostats, and other electrical apparatus not specified," which are dutiable at 0.505 gold peso per gross kg.

Extensions to the Belfast works of Messrs. Hugh J. Scott & Co.

Transporting a Large Transformer

In September last we reported the despatch from London to Australia of a 37,500-kVA transformer weighing sixty-six tons, made by the British Electric Transformer Co., Ltd. Special arrangements had to be made for transporting the plant on its arrival in Australia, as, owing to its size, it was not possible to use the railway. It was therefore loaded on to a special vehicle at the dock, which consisted basically of a carrying tray, supported in front by a low four-wheeled float and at the back by a six-wheeled bogie, all the ten wheels being solid-rubber-tyred. The weight of the vehicle was 26½ tons and the length, without tractors, about 60 ft. The carriage was pulled by three, and in one place by six, tractors connected by wire ropes. The journey, which included crossing the Yarra by ferry, was completed without mishap. The accompanying illustration shows the transformer loaded on the vehicle.

A large B.E.T. transformer in Australia on the last stage of its long journey

Recent Contract

The power of the Radio Suisse Romande is shortly to be considerably increased. The order for a new 100-kW station of the latest design has been placed with Standard Telephones & Cables, Ltd., who also constructed the existing 25-kW station in 1930. Work has already commenced in the New Southgate factory of the company on the building of this new transmitter, which incorporates the "series" system of modulation and the "floating carrier" principle. The high-power amplifier stages of the transmitter will be built in concrete cubicles. This system was introduced in the "Standard" 60 and 120-kW stations at Kalundborg and Budapest. The approximate value of the order is £30,000. The new station will be brought into operation in the autumn of this year.

Halifax Street Lighting

A lecture-demonstration on the principles of street lighting was given by Mr. W. J. Jones, manager of the Lighting Service Bureau, on January 24th at the Halifax Corporation electricity showrooms. Referring to the street lighting of Halifax, he said that except for the central portion of the town it was totally inadequate. He described the improvements made in electric lamps, and stated that if they had electric street lighting throughout the town they would be able to get 50 per cent. more light in the streets without extra cost.

The Netherlands Import Quotas

Particulars are given in the *Board of Trade Journal* of quotas fixed for the import of the United Kingdom goods into the Netherlands during the period from January 1st to July 31st next. These include electric vacuum cleaners, insulated electrical conductors, and electric lamps.

An Irish Company's Extensions

In order to cope with an increasing demand, Messrs. Hugh J. Scott & Co. (Belfast), Ltd., manufacturers of a.c. and d.c. motors, are carrying out large extensions at the rear of their existing works in Ravenhill Avenue, Belfast. As our picture shows, the framework of the new premises has already been erected, and when this building is completed it will add one-third to the area of the works which will then have a total length of 390 ft.

A Buyers' Guide

The 1935 edition of "Where to Buy" (published by "Where to Buy," Ltd., 2s. 6d. post free), is now available. As in preceding issues, it contains lists of manufacturers and suppliers of electrical plant, domestic appliances, radio apparatus, &c., and registered trade names.

Price Lists Required

The Seaton & District Electric Light Co., Ltd., is shortly opening electricity showrooms and asks for price lists, together with discounts, of electric lighting, heating, cooking and power apparatus, to be sent to the engineer and manager, Electricity Offices, Seaton, Devon.

New Municipal Showrooms

The Luton Town Council has purchased premises in George Street for conversion into electricity showrooms. The purchase price is £25,000, and the estimated cost of adaptation £3,000.

A New Ferranti Factory

Messrs. Ferranti, Ltd., are at the present time in course of equipping a new factory situated at Moston, about one mile from the company's existing works at Hollinwood, which will be devoted exclusively to the manufacture of radio equipment. The new factory, which has a floor space of 260,000 sq. ft., is

A section of the new Ferranti radio factory

to be equipped with the most up-to-date plant available, and will be in full production for the next radio season. It is anticipated that it will find employment for at least 3,000 people. The new valve factory, which will be in production in March, is shown in the accompanying illustration.

Change of Name

Instanta Electric Signal Clocks, Ltd., has changed its name to Instanta Electric, Ltd.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances.

CHEMICALS, ETC.	Price. January 30th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti friction Metals—		
Grade I ... ... per ton net	£208	—
Grade II ... ... ,,	£143	—
Grade III ... ... ,,	£70	—
c Brass (rolled metal 2" to 12" basis)... per lb.	6½d.	—
c ,, Tubes (solid drawn) ... ... ,,	8¼d. to 9d.	—
c ,, Wire, basis ... ... ,,	7d.	—
c Copper Tubes (solid drawn)... ... ,,	9½d.	—
g ,, Bars (best selected)... ... per ton	£68	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£31 15s.	—
g ,, ,, Sheets ... ,,	£30 15s. to £31	5s. to 10s. dec.
d ,, ,, Wire Rods ... ,,	£36	—
d ,, ,, H.C. Wire ... per lb.	6½d.	—
f Ebonite Rod ... ... ,,	1/6 to 2/– plus 1/3 to 1/6 10%	—
,, Sheet ... ... ,,		—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4¼d.	¼d. dec.
i Iron, Pig (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire galv. No. 1, P.O. qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£12 10s.	—
g Mercury ... ... per bot.	£11 15s.	—
e Mica (in original cases) small ... per lb.	6d. to 4/–	—
e ,, ,, medium ... ,,	5/– to 10/–	—
e ,, ,, large ... ,,	10/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	10¾d.	—
p ,, ,, rolled strip & Sheet ,,	10½d.	—
p ,, ,, wire ... ... ,,	11½d.	—
o Platinum ... ... per oz.	£7	15s. dec.
d Silicium Bronze Wire ... ... per lb.	7¾d.	—
r Steel, magnet, in bars ... ... ,,	7½d.	—
g Tin, Block (English) ... ... per ton	£232/15 to £234/15	£1 15s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

French Trade in Domestic Electrical Appliances

The appended table shows the French imports and exports of domestic electrical appliances during the nine months ended with September last as compared with the corresponding period of 1933. It will be seen that both sections of the trade show a considerable expansion, particularly as regards the imports.

	IMPORTS. Jan.—Sept. 1933. Fr.	IMPORTS. Jan.—Sept. 1934. Fr.	EXPORTS. Jan.—Sept. 1933. Fr.	EXPORTS. 1934. Fr.
Electric fires and stoves ...	3,196,000	3,215,000	2,095,000	8,502,000
Electric irons	115,000	125,000	176,000	
Electric vacuum cleaners, boot cleaners, etc.	3,452,000	3,351,000		
Electric refrigerating machines, etc.	3,294,000	13,086,000	4,624,000	
Electric fans	988,000	911,000		
Total fr.	11,045,000	20,688,000	6,895,000	8,502,000
Total at 75 fr. to £ ...	£147,266	£275,840	£91,935	£113,360

The chief feature of the imports is the marked increase which is taking place in France in the purchase of imported household refrigerators, last year's nine months' total being more than double that of 1933. As a result of Government economy measures, the French Customs authorities are condensing the information given on the export side, only one total for the various items being now given.

Rubber Cables in Germany

A further restriction in the use of rubber in Germany has been made by official ordinance. For the production of rubber coverings for conductors and cables it is now forbidden to use mixtures with a rubber content of over forty-nine parts in volume per 100. A number of specified conductors is exempted from this regulation.

Social Event

Following a dinner, the annual meeting of the Sheffield Electricity Supply Department Sports Club was held recently. Mr. E. Morgan, who acted as chairman, dealt with the re-election of officials, a proposal to change the sports ground, and other matters. Mrs. Morgan presented prizes and trophies won during the year.

For Sale

Messrs. T. C. and W. F. Keay will sell by auction on February 13th and 14th, at Logie Works, Dundee, electrical plant including transformers and motors.

(See our classified advertisements.)

Russian Orders for Great Britain

Arcos, Ltd., has announced that negotiations have been completed for placing cash orders in this country for various machinery and equipment involving a sum of over £1,000,000, for shipment to the Soviet Union. Large purchases have also been made of re-export goods, mainly from British Dominions and Colonies. The orders are to be executed over a period from three to twelve months, and are distributed over Manchester, Birmingham, Sheffield, and Scotland. Among the orders is one for machinery and equipment for Soviet paper factories.

New Catalogues and Lists

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—A leaflet describing electrical equipment for the dairy.

Revo Electric Co., Ltd., Tipton, Staffs.—A leaflet on new accident-proof street-lighting equipment.

Marconiphone Co., Ltd., 210, Tottenham Court Road, London, W.1.—Four large broadsheets on the new "Jubilee" receivers.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.—A catalogue on electrostatic precipitation.

Eca-Ray Sales, Ltd., 3, Sandland Street, High Holborn, W.C.1.—A catalogue of "Eca-Ray" silvered glass reflectors.

A display of "Creda" electric fires by the Simplex Electric Co., Ltd., at the showrooms of the Brompton and Kensington Electricity Supply Co., Ltd.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—Particulars of the new coiled-coil lamps.

Hugh J. Scott & Co. (Belfast), Ltd., Volt Works, Ravenhill Avenue, Belfast. A folder describing Scott a.c. and d.c. motors.

Stokes Appliances, Ltd., 22, Chandos House, Buckingham Gate, S.W.1.—A cookery chart for use with the Stokes radiant heat cooker.

Harcourts, Ltd., 21a, Newman Street, Oxford Street, W.1.—A catalogue of lighting fittings.

Herbert Morris, Ltd., Loughborough.—A catalogue on the new Morris electric overhead crane.

Bankruptcy Proceedings

W. S. Ellis, electrical engineer, lately of 151, Church Street, Kensington, W.—This debtor recently attended at the London Bankruptcy Court before Mr. Registrar Warmington for public examination upon accounts showing liabilities of £3,219 and assets £13. Replying to the Official Receiver, the debtor, an Australian, said he came to this country in 1920 and for some years acted as managing director of an engineering company. In June, 1931, he began business as an electrical engineer and factor under the style of "Auto-Electric and Components Company," Victoria Street, S.W., removing in October, 1931, to Edge Street, W. He was joined in September, 1932, by a partner, who provided £300. The business was continued until May, 1933, when the partnership was dissolved by mutual agreement, witness agreeing to repay his partner's capital, together with 5 per cent. interest. Nothing had been paid, however, and the partner was a present creditor for £362. He afterwards continued the business alone, removing to 151, Church Street, W., where he remained until the landlord distrained last May, whereupon the business came to an end. The failure was attributed to bad trade and loss of custom. The Official Receiver questioned the debtor at some length regarding an alleged loss of £1,354 on the trading, and eventually the hearing was adjourned until March 13th for the debtor to furnish trading and profit and loss accounts.

E. W. Ledder (trading as Cheshire East Electrical Co.), 339, Park Lane, Macclesfield, Cheshire.—The public examination was held at the Town Hall, Macclesfield, recently. Debtor said he had been appointed agent for the distribution of certain electric lamps and in that capacity had had considerable expense in establishing a connection. His deficiency amounted to £205, and he attributed his failure to the termination of the agency. The examination was concluded.

W. J. Richardson, wireless dealer, 14, Highthorne Avenue, Bradford Moor, Bradford.—Receiving order made January 21st on debtor's own petition. First meeting February 1st at 71, Manningham Lane, Bradford. Public examination February 26th at the County Court, Bradford.

G. Harding, electrical engineer, The Grange, Barcombe, Sussex.—First meeting February 1st at 8, Old Steine, Brighton. Public examination March 13th at the Court House, Church Street, Brighton.

B. M. Brice, electrical works manager, 42-44, Castle Hill Road, Hastings.—First meeting February 1st at 8, Old Steine, Brighton. Public examination March 4th at the Town Hall, Hastings.

C. J. Mount, electrical contractor, "White House," East Acton Lane, W.3.—Trustee, Mr. J. L. Poland, 29, Russell Square, W.C., Official Receiver, released January 21st.

D. Tweedle, radio and electrical engineer, 42, Market Street, Milnsbridge, Huddersfield.—Trustee, Mr. J. O. Morris, 71, Manningham Lane, Bradford, Official Receiver, released January 17th.

H. Bannister (Henry Bannister & Co.), electrical goods factor, 48, Old Moat Lane, Withington, Manchester.—Trustee, Mr. N. McKellen, 20, Booth Street, Manchester, released December 12th.

J. H. Withycombe, electrical engineer and wireless dealer, 61, High Street, Barnstaple.—Last day for receiving proofs for dividend February 12th. Trustee, Mr. W. P. Hatton, c/o Messrs. Ware, Ward & Co., The Strand, Barnstaple.

G. Y. Entwistle, electrician, 63, Shorey Bank Yard, Darwen.—Last day for receiving proofs for dividend February 9th. Trustee, Mr. J. W. Carter, District Bank Chambers, Blackburn, Official Receiver.

A. E. Douch and **M. G. Willis** (Douch & Willis), radio and electrical engineers, 109, High Street, Dover.—Last day for receiving proofs for dividend February 8th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

H. N. Wicks (Harold Wicks & Co.), electrical specialist, Railway Hotel Buildings, Greenhithe.—First and final dividend of 1s. 5½d. in the £, payable February 5th at 280A, High Street, Rochester.

R. C. Stevens, wireless dealer, The Green, Billingham.—First and final dividend of 4s. 7d. in the £, payable January 31st at 80, High Street, Stockton-on-Tees.

A. E. L. Trebilcock (trading as Lionel Trebilco), wireless dealer, Holyrood Street, Chard.—First and final dividend of 5d. in the £, payable January 29th at the Official Receiver's office, Exeter Bank Chambers, Broadgate, Exeter.

B. S. Jones (North Wales Battery Service), Buxton House, Barmouth.—First and final dividend of 1s. in the £, payable January 29th at 4, Queen Street, Carmarthen.

Company Liquidations

Lotus Radio, Ltd.—Particulars of claims by February 14th to Messrs. W. T. Wood and F. C. Marsh, 3, Lord Street, Liverpool, joint liquidators. Meetings, February 28th at 3, Lord Street, Liverpool, to receive an account of the winding-up by the liquidators.

Taylor & Romany, Ltd.—Meeting, February 28th at 199, Piccadilly, W., to receive an account of the winding-up by the liquidator, Mr. R. S. Yates.

Robert Bowran & Co., Ltd.—Meeting, February 25th at 4, St. Nicholas Buildings, Newcastle-on-Tyne, to receive an account of the winding-up by the liquidator, Mr. J. F. Chapman. This liquidation is for reconstruction purposes only.

Recent Government Contracts

The following contracts were placed by the various Government Departments during December :—

ADMIRALTY.

Centrifugal blower and h.p. air compressors.—Reavell & Co. Sub-contractors for electrical equipment: W. H. Allen, Sons & Co.

Electric cable and joint boxes.—Siemens Bros.

Cells.—Alklum Storage Batteries; G.E.C.

Electric cranes.—Sir Wm. Arrol & Co. Sub-contractors: Laurence, Scott & Electromotors; Lancashire Dynamo & Crypto; Vlasto, Clark & Watson.

Turbo-generators.—Met.-Vick. Elecl. Co.

Electric lift.—W. Wadsworth & Son. Sub-contractors for electrical equipment: Mawdsleys.

Horizontal plain milling machine.—J. Parkinson & Son. Sub-contractors: Crompton Parkinson for motors; Allen West & Co. for control gear.

Hydraulic plate flanging press.—H. Smith & Co. Sub-contractors: Lancashire Dynamo & Cryto Co. for motors; Electrical Apparatus Co. for control gear.

Welding resistances.—Quasi-Arc Co.

Automatic screw machine.—B.S.A. Tools. Sub-contractors for electrical gear: Met.-Vick. Elecl. Co.; B.T.H. Co.; A. Butterworth & Co.

Reconstruction and reconditioning of turbine and generator.—Peter Brotherhood. Sub-contractor for generator: Met.-Vick. Elecl. Co.

Wireless valves.—G.E.C.

Electric incandescent lamps.—G.E.C.; Siemens Electric Lamps & Supplies; B.T.H. Co.; Ediswan.

WAR OFFICE.

Submarine cable and w.p. cases.—Siemens Bros.

Electric pumps.—Gwynne Pumps.

Wiring for electric lighting.—Berwick-on-Tweed: Lowden Bros. & Co. Colchester Barracks: D. Bentley (Leicester).

AIR MINISTRY.

Generating set at Pembroke Dock.—Davey, Paxman & Co. (Colchester).

P.i. cable.—Derby Cables.

Electric crane.—Cowans, Sheldon & Co.

Ceiling fans.—Crompton Parkinson.

Film.—B.T.H. Co.

Lamps.—G.E.C.

Metal rectifiers.—Westinghouse Brake & Saxby Signal Co.

POST OFFICE.

Telephonic apparatus.—Automatic Electric Co.; Thomas De la Rue & Co.; Ericsson Telephones; G.E.C.; Phœnix Telephone & Electric Works; Plessey Co.; Siemens Bros. & Co.; Telephone Manufacturing Co.

Testing and protective apparatus.—Evershed & Vignoles; Phœnix Telephone & Electric Works; H. W. Sullivan; Westinghouse Brake & Saxby Signal Co.

Wireless apparatus.—R. I., Ltd.

Battery stores.—Ever Ready Co. (Great Britain).

Cable.—B. I. Cables; Connollys (Blackley); Hackbridge Cable Co.; Siemens Bros.

Electric clocks.—Gillett & Johnston; Magneta Time Co.

Loading coils.—Automatic Electric Co.

Telephone cords.—B. I. Cables; London Electric Wire Co. & Smiths; L. P. S. Electrical Co.; Phœnix Telephone & Electric Works; Reliance Electrical Wire Co.; Siemens Bros.; Standard Telephones.

Dynamotors.—W. Jones & Co.

Electric lamps.—J. H. Naylor.

Transformers.—Siemens Bros.

Rod zincs.—Eyre Smelting Co.; Siemens Bros.

Cabling and loading coils.—Edinburgh-Galashiels: United Telephone Cables.

Electric lifts.—R. J. Shaw & Co.; W. Wadsworth & Sons; Marryat & Scott.

Electric lighting.—A. Hawkins & Sons.

Telephone exchange equipment.—Hunslet; Wythenshawe.—Automatic Electric Co. Loughborough.—Ericsson Telephones. Sub-contractors: Chloride Electrical Storage Co. for batteries; Electric Construction Co. for motor-generator. Droylsden.—Ericsson Telephones. Sub-contractors: Pritchett & Gold & E.P.S. Co. for batteries; Electric Construction Co. for motor-generator. Grangewood.—Ericsson Telephones. Manchester Central.—G.E.C. Sub-contractors: D. P. Battery Co. for batteries; Bruce Peebles & Co. for motor-generator; W. Jones & Co. for ringing machines. Broughty Ferry (Dundee); Coventry; Salisbury; Chesterton.—G.E.C. Edinburgh: Davidson's Mains, Granton, Liberton, Murrayfield, Portobello, Abbeyhill, Colinton, Corstorphine; Mitcham.—Siemens Bros. Great Yarmouth.—Siemens Bros. Sub-contractors: Hart Accumulator Co. for batteries; Electric Construction Co. for motor-generator and ringing machines. Birmingham trunk and toll exchange; Hop (London).—Standard Telephones. Sub-contractors for Hop: Tudor Accumulator Co. for batteries; Electric Construction Co. for motor-generator; W. Jones & Co. for ringing machines. Ealing.—Standard Telephones. Sub-contractors: Chloride Electrical Storage Co. for batteries; Electric Construction Co. for motor-generators; W. Jones & Co. for ringing machines. Loose (Maidstone); London trunk exchange; Leigh-on-Sea.—Standard Telephones.

Telephonic repeater equipment.—Belfast: G.E.C.

Voice-frequency telegraph equipment.—London; Brighton: Standard Telephones.

CROWN AGENTS FOR THE COLONIES.

Broadcast relay service.—G.E.C.

Cable, &c.—Callender's; Henley's.

Domestic hot-water service.—Sulzer Bros. (London).

Generator, &c.—Merryweather & Sons.

Telephone apparatus.—G.E.C.

Wood separators.—Chloride Electrical Storage Co.

Electricity Supply

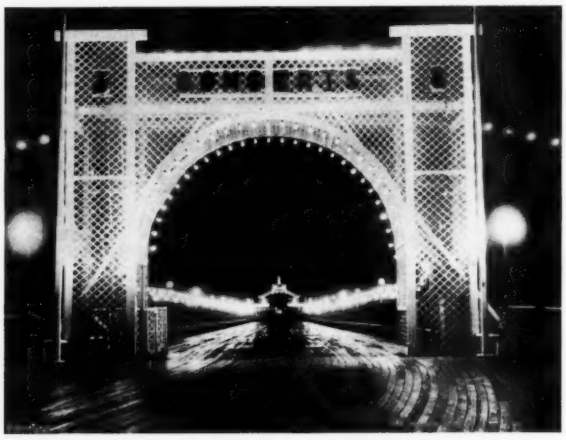
Lighting, Domestic, Power

Aberdeen.—POWER STATION SCHEME.—It is proposed to extend the test room and offices at the Ferryhill power station, at an estimated cost of £3,619.

Australia.—PROTECTION FOR PORT KEMBLA SCHEME.—The New South Wales Government has introduced a Bill which is designed to force the tableland Councils to obtain their electricity supplies from the Government power station at Port Kembla instead of from a private company at Berrimac. The Bill provides for the co-ordination of the Port Kembla system with the Burrinjuck scheme, and it is proposed to extend the network over the south coast and the southern tableland.

Aylesbury.—ELECTRICAL IMPROVEMENTS.—The Town Council has decided to extend the supply at Thame (£380), and to improve the lighting of Tring Road (£295).

Barton-upon-Humber.—UNIFICATION PLANS.—A further step in the unification of supply in the sphere of operations of the



Preparations are already being made for the illuminations at Torquay. Here is the brilliantly lighted entrance to the pier

Yorkshire Electric Power Co. is marked by an application which is being made by its subsidiary, the North Lincolnshire & Howdenshire Electricity Co., Ltd., in respect of Barton-upon-Humber. The existing Barton Order is to be revoked and a new one granted to the latter company so that it may operate the undertaking in conjunction with the wide area in North Lincolnshire and Yorkshire which it now supplies.

Bexhill-on-Sea.—LOANS.—Sanction has been received to a loan of £21,650, the balance required in connection with the first stage of the change-over, and to £1,776 for the e.h.v. interconnector cable between Highwoods and Sibley substations.

Birchington.—OVERHEAD LINES.—As a result of a recent inquiry, the Ministry of Transport has consented to the use of overhead lines at Birchington-on-Sea by the Isle of Thanet Electric Supply Co., Ltd.

Blofield.—RURAL SUPPLIES DEMANDED.—The Rural District Council is to approach the Electricity Commissioners with a view to the Norwich Corporation being asked to supply electricity to a number of scattered villages.

Bolsover.—ELECTRICITY FOR STANFREE.—The Urban District Council has instructed the electrical engineer to report on the question of supplying electricity to Stanfree.

Brighton.—IMPROVED STREET LIGHTING.—A scheme of street lighting improvements at an estimated cost of £18,979 is proposed by the Electricity Committee.

REVISED TARIFF.—A fixed charge in the two-part tariff "B" for shops, offices and hotels, of £12 10s. per kW, instead of £15 per annum, has been recommended.

CHANGE-OVER.—In connection with building developments at Withdean the Committee is to change over the supply to a.c. (£8,389).

SUPPLY EXTENSION.—The Committee is to provide a supply to Newtimber (£524), and has authorised the modification of the h.v. connections to King's Road and Castle Square substations (£1,067). Other mains are to be extended at an estimated cost of £1,420.

THERMAL STORAGE SYSTEM.—The Education Committee is to install an electrical thermal storage heating system at Whitehawk school (£275).

Broadwindsor.—PROSPECTS OF SUPPLY.—The South Somerset Electricity Co. will probably have extended its mains to the village in time for next winter, and the Parish Council is to consider the question of street lighting.

Buckinghamshire.—OVERHEAD EXTENSIONS ALLOWED.—The Minister of Transport has allowed the application of the Wycombe (Borough) Electric Light & Power Co., Ltd., and the Wessex Electricity Co., Ltd., for sanction to place overhead lines for the supply of electricity at Booker and Sands.

Bulgaria.—ELECTRICAL DEVELOPMENT.—Random development has characterised the growth of electrical production, states Mr. R. B. B. Tollinton, commercial secretary, Sofia, in a report on "Economic Conditions in Bulgaria," issued by the Department of Overseas Trade (H.M. Stationery Office. 2s. 6d. net). Apparently the capacity of installations was doubled between 1928 and 1931, while consumption increased by only 26 per cent. As a result the existing power stations were working at 15 per cent. of their capacity in 1931, but none the less further development occurred in the following year, when the aggregate kW reached 74,513 (73,388 kW in 1931). Mr. Tollinton finds that the industry needs rationalising, and reports that the Ministry of Public Works is stated to be preparing a reorganisation plan. Electricity is available to 93.2 per cent. of the urban population and 5.25 per cent. of the rural population. In 1932 the average consumption per person was 24.1 kWh.

Colwyn Bay.—FRINGE ORDER APPROVED.—The Town Council has approved an application by the Electricity Distribution of North Wales & District, Ltd., for a Fringe Order to supply certain property at Rhydyfoel, within the Council's area of supply, and has sanctioned the erection of overhead lines.

Coulsdon and Purley.—ELECTRIC STREET LIGHTING.—The Urban District Council is to carry out an extensive scheme of replacing gas street lamps by electric lamps.

Coventry.—MAINS EXTENSIONS.—The Electricity Committee is seeking sanction to borrow £3,738 for mains extensions, &c.

Croydon.—GENERATING PLANT EXTENSIONS.—A scheme for extending the generating station at an estimated cost of £7,300 is favoured by the Electricity Committee. In addition, further switchgear will be required in connection with the proposals (£14,950), and a further boiler is to be equipped with Bailey furnace walls and to undergo other modifications, at an estimated cost of £7,100.

IMPROVED LIGHTING.—The Committee recommends a scheme for improving the lighting of Portland Road and Spring Lane (£1,242).

ROYAL JUBILEE.—Preparations are being made for celebrations on a large scale in connection with the Royal Jubilee, and, apart from £1,000 to be spent by the Town Council on the general arrangements, the Electricity Department is to carry out special illuminations at a cost of £2,000.

Droxford.—ROWASH.—The Electric Lighting Co. is to be asked whether there is any prospect of the company extending its supply to Rowash.

Enfield.—SUPPLY TO ESTATE.—The Housing Committee has under consideration the question of the provision of a supply of electricity to tenants on the Albany Estate.

France.—HIGH-VOLTAGE TRANSMISSION LINES.—The Société de Transport d'Energie du Centre has recently raised the voltage on its power transmission line from the hydro-electric station at Truyere to Monistrol d'Allier from 150 to 220 kV. This has enabled a connection to be made with the 220-kV network from Truyere to the Paris area. At Monistrol a substation has been established to step down from 220 to 150 kV, at which voltage power is transmitted by a line between Monistrol and St. Etienne to the distribution network of the Compagnie Electrique de la Loire et du Centre.

Glasgow.—CHEAPER ELECTRICITY.—Councillor A. Munro, convener of the Electricity Committee, was the principal speaker at the annual luncheon of the Electrical Association for Women at Glasgow on January 22nd. He said that, although energy in Glasgow was at the moment as cheap as that derived from the Niagara Falls, the Committee had decided to reduce the price again this year. He mentioned that the price might be reduced to 10 kWh for 3d., which meant that electricity would cost (instead of ¾d.) 0.33d. per kWh. Mr. Munro believes in the value of electricity in the home, so much so that he confessed to having possessed an all-electric house even when he was convener of the Gas Committee. Referring to the smoke menace, he said electricity had played its part in alleviating this evil. Four years ago the annual soot-fall in Glasgow was 290 tons; to-day it was 240 tons.

MAINS.—The Electricity Committee is to have mains laid at a cost of £10,559.

Great Britain.—GALE HAVOC.—During the gales which swept the country last week the 33-kV cables at Adswood, near Stockport, were blown from the towers and fell across the L.M.S. railway line. A train collided with them, but no damage was done. A large tree, blown over by the gale, broke the Central Electricity Board's lines between Northampton and Kettering. At 3.45 a.m. on Saturday the supply failed completely on all lines at Kettering power station, which relies solely on the grid supply from 10 p.m. to 7 a.m., but an alternator was quickly brought into service. In addition to the Kettering supply area, parts of Wellingborough and Rushden were without electricity, but Northampton was unaffected.

Great Yarmouth.—The Public Assistance Committee has requested the electrical engineer to prepare a specification and estimate of the cost of installing electric lighting at the Institution.

Harrogate.—SPECIAL ORDER.—Application has been made for a Special Order for the transfer of the Ripon undertaking to the Harrogate Corporation.

Holme-on-Spalding-Moor.—NEGOTIATIONS FOR SUPPLY.—The Parish Council is negotiating with the North Lincolnshire & Howdenshire Electricity Co., Ltd., and the Electricity Commissioners for an early supply of electricity.

Houghton.—OVERHEAD LINES.—The North-Eastern Electric Supply Co. proposes to erect overhead lines at Salters' Lane, Grindon, and Broderick Terrace and William Terrace, Newbottle.

Hull.—REDUCED CHARGES.—Reductions in the electricity charges to the extent of £25,275 per annum, becoming operative on April 1st, have been announced by the Council.

India.—ELECTRIC CRANES AT MORMUGAO.—Four electric cranes have recently been put into commission at the Mormugao harbour, according to *Lloyd's List*. Eight more electric cranes are to be ordered by the Railway authorities.

Inverness.—A £28,000 SCHEME.—When the approval of the Town Council and the Moray and Nairn County Council is received, a £28,000 scheme of lighting and heating the Mental Hospital is to be proceeded with. The scheme provides for internal electrical plant.

Irish Free State.—DUBLIN.—According to the Dublin *Saturday Review*, erosion caused by dirty water passing through the seven condensers at the Electricity Supply Board's Pigeon House Fort steam power station costs the Board £1,000 every year for each condenser, and the Board has therefore embarked on the erection of a new pumping-house which will take the condenser water from the central channel of the River Liffey instead of from the coal harbour as at present. The work will be carried out by an Irish firm under Mr. J. T. Paul, the company's engineer, who will be assisted by a German engineer, Herr Schnitter. Practically all the machinery and equipment have come from Germany.

Jarrow-on-Tyne.—A CHANGE OF PRACTICE.—Owing to the demand for electric lighting, the Town Council has decided to request the borough engineer to include an estimate of the cost of providing installations in 160 houses which it is proposed to erect. The Council has previously installed gas in its houses.

Kingston-upon-Thames.—STREET LIGHTING IMPROVEMENTS.—Following experiments in Cambridge Road, Norbiton, the Electricity Department is inviting tenders for a permanent electric-discharge lamp street lighting installation, which is to be extended eventually to all the main roads of the town.

London.—LEWISHAM.—The Borough Council is to install electricity in seventy-three houses on the Lewisham Park Estate at a cost of £580.

BATTERSEA.—The Electricity Committee has been authorised to borrow £18,000 for rental wiring installations; £29,000 for mains and services; and £7,423 for switchgear and sub-station equipment.

BERMONDSEY.—The Electricity Committee is seeking sanction to borrow £30,000 for mains and services, meters and "free" wiring.

FULHAM.—For further expenditure in connection with the extension of the Council's generating station, under the South-east England electricity scheme, the Electricity Committee is seeking sanction to borrow £1,000,000.

ST. MARYLEBONE.—The Electricity Committee is to seek sanction to borrow £7,758 for cable, switchgear and incidentals in connection with the bulk supply to Hampstead Borough Council and £3,412 for switchgear, &c., for the Department.

ST. PANCRAS.—The Council has decided to improve the street lighting in High Street, Camden Town, N.W., by the erection of a number of extra electric lamps and improvements to the existing ones. Various types of electric-discharge lamps are to be tried.

The Electricity Committee is to apply for sanction to a loan of £505 for e.h.v. mains. Switchgear at the Ossulston Street sub-station is to be altered at a cost of £1,000, and new mains are to be laid to the Northcourt sub-station, costing £1,285. Other mains extensions are proposed, costing £916.

STEPNEY.—The Council has purchased 3,000 six-pint electric kettles in connection with the domestic hire scheme which it recently decided to introduce.

Melton Mowbray.—SUPPLY TO ASHFORDBY.—The Mid-Lincolnshire Electric Power Co. proposes to extend its supply to Ashfordby.

Minehead.—DECORATIVE LIGHTING.—A scheme of decorative lighting is to be provided at the Blenheim Gardens.

Morecambe.—SUB-STATION.—The Electricity Committee proposes to erect a sub-station adjoining the sanatorium site at Bare.

Newcastle-on-Tyne.—AN INQUIRY.—When an inquiry was held by the Ministry of Health into an application by the City Council for permission to buy 168 acres of land outside the city area for rehousing purposes the North-Eastern Electric Supply Co., Ltd., objected on the ground that the Council intended giving notice to have overhead wires on the land placed underground, which would involve an expenditure of £12,000. Mr. E. N. Robinson, for the company, pointed out that the overhead lines gave a supply to the collieries of Northumberland and were extremely important.

North Cave (Yorks).—SUPPLY ARRANGEMENTS.—A supply of electricity will be made available shortly, and a public meeting is to be held to decide whether street lighting shall be installed.

North Newbald.—STREET LIGHTING.—A parish meeting decided recently to have electric street lighting installed in the village as soon as possible.

Northern Ireland.—MALICIOUS INTERFERENCE.—Throughout Thursday night last week engineers and linesmen searched for the cause of an electricity failure that had plunged practically the whole of Co. Down into darkness, and eventually discovered that a piece of galvanised wire had been thrown across the overhead lines between Castlewellan and Annesborough, which area was without electricity all night, though the Electricity Board was able to restore the service to the rest of the county generally after twenty minutes. Malicious interference has for some time been troubling the Electricity Supply Board, similar incidents having occurred elsewhere on its system.

PORTRUSH UNDERTAKING.—The Urban District Council has decided to dispose of the undertaking to the Antrim Supply Co., Ltd., subject to the sanction of the Ministry of Commerce.

Oldham.—ELECTRICITY AND COTTON SPINNING.—In its annual report the Master Cotton Spinners' Association states that the cheapest rate to large power users is about 0.45d. per kWh, while the equivalent cost of a first-class steam power-raising plant is 0.325d. or even less. The Association states it has instances of firms which have converted their steam plant to electricity, but it is doubtful if any of them are satisfied that their cost for power has been reduced. A committee of the Master Cotton Spinners' Association has put forward a request that the electricity supply authorities should aim at supplying large power consumers at a basic price of 0.35d. per kWh.

Peterborough.—STREET LIGHTING.—The City Council is preparing a comprehensive street lighting improvement scheme to be spread over several years.

Rawtenstall.—MAINS EXTENSIONS.—The Electricity Commissioners have sanctioned a loan of £20,000 for mains extensions, and the Council has decided to seek borrowing powers for a further £10,000 for services.

Romsey.—MAINS EXTENSIONS.—The Rural District Council has approved the extension of mains to Rownhams by the West Hampshire Electricity Co., Ltd.

Stockton-on-Tees.—SUB-STATIONS.—To cope with the increasing demand sub-stations are required at Norton, Hartburn, Eaglescliffe, and at the east end of the Durham Road recreation ground, and the Electricity Committee has the matter under consideration.

PURCHASE OF EQUIPMENT.—The Town Council is seeking sanction to spend £3,594 of the 1933-34 electricity surplus revenue on the purchase of meters and cookers.

South Hinksey.—STREET LIGHTING.—Electric street lighting is to be installed in the Kennington district.

Switzerland.—A DIESEL-ENGINED POWER STATION.—The Société des Forces Motrices de Saint Gall et d'Appenzell, which owns four hydro-electric power stations, has recently found it necessary to supplement these by a 22,200 h.p. Diesel-engined station. According to the *Revue Générale d'Electricité*, the new plant, which is located near the Kubel hydro-electric station on the Sitter, is the largest of its kind in Europe, and is exceeded only by the 50,000 h.p. station in Shanghai, China. The installation comprises three Sulzer-Diesel double-acting two-stroke engines coupled direct to Oerlikon 6,250 kVA alternators, generating power at 10,700 V. The engines are started by compressed air and it is claimed that when an unusually heavy power supply is demanded one of the sets can be started up in two minutes and the whole three within five minutes.

Wantage.—OVERHEAD EXTENSION.—The Rural District Council has consented to the erection by the Wessex Electricity Supply Co., Ltd., of an overhead line at Harwell.

Wayland.—OVERHEAD LINES.—The East Anglian Electric Supply Co. is to extend overhead lines along Harling Road, Kenninghall.

West Hampshire.—FLOODLIGHTING IN RURAL AREAS.—The excellent electrical publicity to be obtained by floodlighting is

In villages, where notable buildings are few, churches provide useful subjects for floodlighting; an example of effective treatment is seen in this picture of the parish church at Ringwood, Hampshire

frequently regarded as the perquisite of urban undertakings. The West Hampshire Electricity Co., Ltd., however, in the course of its lighting campaigns organised in collaboration with the Electric Lamp Manufacturers' Association, have shown convincingly that rural areas offer opportunities for floodlighting, even if not on so spectacular a scale. The company has sent us photographs of three recent schemes which it has carried out, namely, the floodlighted ruin of the palace at Bishops Waltham, the parish church at Ringwood which stands on a site overlooking the market place, and the Norman Abbey at Romsey. These pictures, one of which we reproduce, show that good results have been achieved, and the company is satisfied that excellent publicity has accrued from its efforts in this direction.

West Hartlepool.—NEW CABLES.—The Electricity Committee has agreed to spend £700 on renewing 2,120 yd. of cable near the timber yards.

Wigton.—STREET LIGHTING.—The Mid-Cumberland Electricity Co., has notified the Rural District Council that electric street lighting will probably be installed soon at Allonby, Kirkhampton, Thursby, Port Carlisle, Kirkbride, Hayton and Bowness.

Traction

Australia.—SYDNEY TRANSPORT UNDERTAKING.—The *New Zealand Electrical Journal* states that an offer of £5,000,000 was recently made to the New South Wales Government for the purchase of the Sydney transport undertaking. The offer was rejected.

Belgium.—RAILWAY ELECTRIFICATION PROGRESS.—The first section of the Brussels to Antwerp electrified line was opened last Friday, although the full service will not be running

An electric train leaving the Haren Nord station, Belgium

until April 15th. The opening coincides with the centenary of the Belgian State Railways.

France.—UNDERGROUND RECEIPTS.—The *Financial Times* states that the Paris Metropolitan Railway Company's total traffic receipts in 1934 amounted to 516,495,360 fr. (£6,886,604 at current rates), against 509,571,711 fr. (£6,794,289) for 1933. The increase is due to the greater mileage open for traffic. The number of tickets issued was 665,835,362, as compared with 654,111,323. The fare is uniform for all distances: 1 franc 15 centimes for first class and 70 centimes for second. The superstructure, tunnels and permanent ways are the property of the City of Paris, and the company works the line on a concession. The company's profits are derived from: A fixed percentage levy on every ticket sold; a 50 per cent. levy on advertisement charges and other non-traffic sources of income; and revenue from invested reserves. Out of these resources the company has to meet all working expenses. Sixty per cent. of the balance remaining goes to the company and 40 per cent. to the Municipality to meet sinking fund and interest on loans issued to cover the cost of construction.

Germany.—A NEW DIESEL-ELECTRIC SERVICE.—The directors of the Reich railways are reported to be so satisfied with the operation of Diesel-electric trains on the route between Berlin and Hamburg that a similar service is to be introduced between Berlin and Frankfort-on-Main next May. It is estimated that the journey will be accomplished in five hours in place of the present eight hours.

Liverpool.—NEW FEEDERS.—Mr. P. J. Robinson, city electrical engineer, commenting on certain tramway breakdowns, states that the Department may have to spend some money in renewing cables, but until a definite policy has been arrived at by the Tramways Committee it is not possible to make plans. In the meantime, existing traction feeders for Lodge Lane are to be renewed at a cost of £2,600; at Prince's Road, £2,700; and in Grove Street and Catharine Street, £6,800.

Rumania.—RAILWAY ELECTRIFICATION.—Various schemes for the electrification of the railway line between Bucharest and Brasov are at present under consideration by the State railway authorities.

Southend-on-Sea.—TROLLEY-BUS EXTENSIONS.—The Transport Committee has approved a suggestion that powers should be sought to provide a trolley-bus service between Eastern Avenue and the junction of North Avenue *via* Sutton Road.

Communications

Australia. — BROADCASTING COMMISSION'S REPORT. — The annual report of the Australian Broadcasting Commission shows that the revenue for the year ended June 30th last was £325,371 and the expenditure £292,737. Of British countries, Australia is now second only to the United Kingdom in the number of wireless listeners in proportion to population and sixth in the world. At the end of June the number of licence holders was 599,159, representing an increase, since the formation of the Commission just over two years ago, of 229,214. Since June the number has increased considerably.

Denmark.—RADIO.—At the end of 1934 the number of listeners was 568,175, equivalent to 16 per cent. of the population.—*World-Radio.*

Great Britain.—BROADCASTING.—In the House of Commons on Monday, the Postmaster-General (Sir Kingsley Wood) was asked when he intended to set up the Commission which is to investigate the working of the British Broadcasting Corporation and its charter during the lifetime of the present Parliament. He replied that there were nearly two years before the charter expired, and he did not consider immediate action necessary.

TELEVISION REPORT.—The Postmaster-General stated that the Television Committee's report had been received, and was at present under consideration. It was his intention that the report should be published, and he hoped to be able to lay it before Parliament within a few days.

TELEPHONES.—It was announced in Parliament that the number of trunk calls made in a representative week since the reduction in rates was 3,062,700, as compared with 2,659,000 in the corresponding period in the previous year.

WAVELENGTH CHANGES.—From February 17th the following wavelengths are to be used by British transmitters (the present wavelengths are given in brackets): North National, 261.1 (296.2); Midland, which is to be operated from Droitwich on 50 kW, 296.2 (391.2); Scottish, 391.1 (373.1); West, 373.1 (307.1); Belfast, 307.1 (267.4); Newcastle, 267.4 (209.9). The North National will be synchronised with the London and West Nationals, which may reduce their power from 50 to 20 kW.

AIRCRAFT RADIO.—The new radio-telephony station equipped with direction-finding apparatus at Pulham, Norfolk, was opened on Monday.

WIRELESS FOR SHIPS.—A proposal that shipowners should receive free service from wireless direction-finding stations was made by Mr. N. B. Barnes, presiding at a meeting of the Liverpool Underwriters' Association. He said the facilities for wireless direction-finding around our coast compared unfavourably with those on the Canadian and American coasts. The importance of this expression of opinion, states the *Daily Telegraph*, lies in the fact that from January 1st this year British passenger ships of 5,000 tons and more are required to be provided with a direction-finding apparatus of a type approved by the Board of Trade. There is no provision, however, compelling ship-masters to make use of wireless direction-finding stations, and experience has shown that while navigators will do so when free service is given, they hesitate to ask for it when a charge is made. In fact, in June, 1932, the station at the Lizard was closed down owing to the insufficient use made of it by vessels approaching from the Atlantic.

Northern Ireland.—BELFAST.—Morse has now disappeared from the telegraph system of Belfast Head Post Office, automatic telegraphy having been established between Downpatrick and Belfast. The whole system of telegraphy at the Belfast office has been changed from morse to automatic.

The Electrical Association for Women

The Harrogate and District Branch of the Electrical Association for Women held its third annual dinner at the Majestic Hotel on the 18th instant, when the president of the branch, Lady Radcliffe, presided over a gathering of one hundred. Lady Watson, proposing the toast of "The Branch," appealed for the greater use of electricity to lighten women's work and for a cheap supply for central heating. Mrs. W. H. Thompson, chairman of the Harrogate branch, replied, and Miss Crompton, the Mayor of Harrogate (Mr. R. C. Hamilton), Councillor C. E. Morris (chairman of the Electricity Committee), and Miss McLean (hon. secretary of the Harrogate Branch), also spoke.

The inaugural meeting of the Worthing branch was held on January 28th and was attended by nearly 200 prospective members. The Mayor, Councillor J. B. Bennett, welcomed the assembly, and Councillor Miss L. E. Walter, chairman of the new branch, introduced Miss Caroline Haslett. Miss M. E. Bell, the hon. secretary, who is also the demonstrator at the Corporation electricity showrooms, outlined the programme of proposed meetings. The borough electrical engineer, Mr. Geoffrey Porter, expressed his willingness to give the branch every assistance.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Angus.—February 15th. County Council. Various works, including electric lighting, at Strathmartine housing scheme. Schedules from, and tenders to, R. H. Anderson, County clerk, Forfar (deposit £1 1s.).

Argentina.—BUENOS AIRES.—April 23rd. State Railway Administration. Machinery and equipment for the electric power station to be installed at the Tafi Viejo workshops. (A.Y. 12894.)*

Australia.—MELBOURNE.—Posts and Telegraphs Department. March 5th. Submarine telegraph cable (shore-end type). (A.Y. 12861.)*

March 19th. Stationary batteries. (A.Y. 12884.)* Battery and magneto private branch exchange cordless switchboards (A.Y. 12882.)* Rectifiers (A.Y. 12883.)*

BRISBANE.—April 15th. City Electric Light Co. One 5,000-kW steam-driven turbo-alternator. (A.Y. 12896.)*

Avonmouth.—March 18th. Port of Bristol Authority. Removal of the existing steam-driven dry dock pumping machinery and the provision and installation of electrically operated pumping machinery at the Royal Edward Dock. Specifications, &c., from W. P. Wordsworth, chief engineer's office, Avonmouth Dock from February 4th on production of a receipt for £3 deposited with the secretary, Port of Bristol Authority, 19, Queen Square, Bristol.

Ayr.—County Council. Heating and electric lighting at alterations and additions at Bank Street public school, Irvine, and Dreghorn public school. Schedules from W. Reid, county architect, are obtainable up to February 2nd.

Bedford.—February 15th. Electricity Department. E.h.p., h.p. and l.p. cables and electric lamps for year ending March 31st, 1936. (January 25th.)

Bexhill.—February 8th. Electricity Department. Two 750-kVA transformers, one 300-kVA transformer, steel kiosk with l.p. control gear, and meters. (See this issue.)

Birmingham.—February 8th. Electric Supply Department. Replating and repairing batteries installed at Camden Street and Saltley sub-stations. (January 25th.)

Blackburn.—February 25th. Electricity Department. Cable, wire and meters for twelve months ending March 31st, 1936. (See this issue.)

Cheadle & Gatley.—February 15th. Electricity Department. Materials for the year ending March 31st, 1936. (See this issue.)

East Riding.—February 6th. County Council. Electric lighting installation at Beverley Institution. Particulars from the County architect (deposit £3 3s.).

Edinburgh.—February 11th. Commissioners of Works. Telephone repeater station at Beattock. Forms of tender from the architect, H.M. Office of Works, 122, George Street (deposit £1 1s.); tenders to the secretary, H.M. Office of Works.

Egypt.—CAIRO.—Ministry of Public Works. March 5th. Overhead transmission lines for the North Delta electricity scheme. (A.Y. 12860.)*

March 25th. Diesel pumping station at Alag. Specifications, &c., from the chief inspecting engineer, Egyptian Government, 41, Tothill Street, S.W.1 (deposit, not returnable, £1 0s. 6d.); tenders to the director-general, Mechanical & Electrical Department, Ministry of Public Works, Cairo.

Fife.—February 19th. County Council. Installation of electricity at Oakley Roman Catholic and Carnock schools. Particulars from the County master of works, Education Offices, Kirkcaldy (deposit £1 1s.).

Harrogate.—February 23rd. Electricity Department. Electrical stores for one year commencing April 1st next. (See this issue.)

Hastings.—February 25th. Electricity Department. Materials for the year ending March 31st, 1936. (January 18th.)

Hazel Grove & Bramhall.—February 16th. Electricity Department. Cable and meters for the year ending March 31st, 1936. (See this issue.)

Hornsey.—Corporation. Electrical wiring and equipment of the Town Hall and Assembly Hall in course of erection. (See this issue.)

Hull.—February 19th. Electricity Department. Meters and time switches. (See this issue.)

Ilford.—February 22nd. Electricity Department. Conversion of one 1,000-kW and one 500-kW rotary convertors to automatic and remote control. (See this issue.)

Irish Free State.—DUBLIN.—February 11th. Electricity Supply Board. Meters for one year from March 1st next. (January 25th.)

Kettering.—February 11th. Electricity Department. Cable and a.c. meters for the year ending March 31st, 1936. (January 18th.)

Kingston-on-Thames.—February 9th. Electricity Department. Stores for one year from April 1st next. (January 25th.)

Kingussie.—February 9th. Town Council. Various works, including electrical, at housing scheme. Schedules from A. Cattanach, architect; tenders to town clerk.

Leeds.—February 15th. Electricity Department. Stores for the year ending March 31st, 1936. (See this issue.)

Leyton.—February 11th. Electricity Department. Supplying and laying cables in connection with change-over from d.c. to a.c. (January 18th.)

Liverpool.—February 7th. Port Sanitary and Hospitals Committee. Engineers' and electrical supplies. Forms of tender, &c., from the town clerk's office, Municipal Buildings, Dale Street; tenders to W. Moon, town clerk, Municipal Buildings.

London.—DEPTFORD.—February 6th. Borough Council. Twelve months' supply of stores, including electric lamps. Particulars from the town clerk.

KENSINGTON.—February 8th. Borough Council. Twelve months' supply of various items, including electrical goods and lamp fittings. Particulars from the town clerk.

BATTERSEA.—February 13th. Electricity Department. Electrical stores for one year from April 1st next. (January 25th.)

STOKE NEWINGTON.—February 25th. Electricity Department. Equipment for Victoria Road sub-station. (January 25th.)

Long Eaton.—February 11th. Electricity Department. Electrical materials for the year ending March 31st, 1936. (January 25th.)

Manchester.—February 8th. Electricity Committee. Motor-driven boiler feed pump, steam-turbine-driven boiler feed pump, high-pressure steam pipes, and steam receiver for Stuart Street power station. (See this issue.)

February 14th. Electricity Committee. Twelve months' requirements of electric cookers. (See this issue.)

Middlesex.—February 18th. Education Committee. Central heating apparatus and hot-water supply at the new County school for girls, Mill Hill. Applications must be made to H. M. Walton, secretary to the Education Committee, 10, Great George Street, S.W.1, by February 4th (deposit £2 2s.). Specifications, &c., may be inspected at the office of the County architect, 10, Great George Street; tenders to H. M. Walton.

Newcastle-upon-Tyne.—February 7th. Housing Committee. Electric lighting in 332 houses on the Ferguson's Lane and Dairy Hill Estates. Particulars from housing architect, 18, Cloth Market.

New Zealand.—WELLINGTON.—Posts and Telegraphs Department. March 4th. 50,000 P.O. type large insulators. (A.Y. 12856.)*

March 27th. Telephone cable. (A.Y. 12899.)*

Public Works Department. March 5th. Seven 8,000-kVA transformers. (A.Y. 12757.)*

March 7th. Telephone switchboard plugs and sleeves. (A.Y. 12881.)*

March 12th. Telephone cable. (A.Y. 12880.)*

AUCKLAND.—May 28th. Harbour Board. Four 5-ton electric semi-portal jib cranes and spares. Particulars from C. R. Butters, 4, Wood Street, E.C.2.

Northern Ireland.—NEWRY.—February 12th. Board of Guardians. Domestic hot water supply, electrical installatons, lifts, &c., at infirmary. Specifications, &c., from T. Houston, 17, Wellington Place, Belfast (deposit £2 2s.).

Salford.—February 2nd. Town Council. Telephone installation at Ladywell sanatorium. Particulars from the medical superintendent of the sanatorium.

February 20th. Electricity Department. Electrical stores. (See this issue.)

Siam.—BANGKOK.—April 12th. Royal State Railways. One self-contained welding plant consisting of a d.c. generator and an a.c. motor. (A.Y. 12897.)*

South Africa.—PRETORIA.—February 22nd. Union Tender and Supplies Board. One motor-generator set and power switchboard. (A.Y. 12898.)*

South Shields.—February 4th. Corporation. Refrigerating plant to replace that existing in the slaughter-houses, Station Road. Specifications, &c., from J. Reid, borough engineer, Town Hall (deposit £2 2s.); tenders to H. Ayrey, town clerk, Town Hall.

February 12th. Electricity Department. Annual supply of stores. (January 25th.)

Surrey.—February 2nd. County Council. Twelve months' supply of electric lamps for institutions, hospitals, &c. Particulars from D. Aukland, clerk to the Council, County Hall, Kingston-on-Thames.

Swansea.—February 12th. Electricity Department. Materials for twelve months from April 1st next. (January 25th.)

Torquay.—February 2nd. Electricity Department. H.p. and l.p. cable. (January 18th.)

February 4th. Corporation. Twelve months' supply of electric lamps. Particulars from the borough engineer.

Walton & Weybridge.—February 11th. Electricity Department. Electrical materials for year ending March 31st, 1936. (January 18th.)

Wednesbury.—February 16th. Borough Council. Electric wiring, &c., of 370 non-parlour type houses at Dangerfield Lane and Crankhall Lane (West). Specifications, &c., from A. Booth, borough surveyor, Town Hall (deposit £1 1s., payable by cheque only); tenders to the chairman of the Housing Committee.

Weymouth and Melcombe Regis.—February 4th. Town Council. Rectifiers, &c., for change-over from d.c. to a.c. in the Rodwell district. Particulars from the borough electrical engineer.

Wiltshire.—February 23rd. Public Assistance Committee. Six months' supply of electric lamps for institutions, &c. Particulars from the public assistance officer, Trowbridge.

Worcester.—February 16th. Electricity Department. Cables, overhead lines, transformers and meters for year ending March 31st, 1936. (January 25th.)

Workington.—February 11th. Steel kiosk sub-station and switchgear, two 3,300-V 75,000-kVA rupturing capacity, automatic oil circuit-breakers, and feeder pillars and underground disconnecting boxes. (January 25th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Birmingham.—Education Committee. Accepted. Improvements to electric lighting installations at various schools.—J. N. Watkins; H. Pratt, Ltd.; E. Hill & Sons.

Croydon.—Electricity Committee. Recommended. Electric boiler (£720) and ozone sterilisation plant (£900) for Purley Way swimming pool.—B. H. Auld & Co.

Glasgow.—Education Committee. Accepted. Electrical work at St. Charles's school extension (£445).—Johnston, Park & Co., Ltd.

Grimsby.—Electricity Committee. Recommended. Supply of electricity to North Cotes aerodrome, &c.—E.h.p. sub-station equipment.—A. Reyrolle & Co., Ltd. (£1,976). E.h.p. cable, Metropolitan Electric Cable & Construction Co., Ltd. (£2,671). E.h.p. kiosk sub-stations, Metropolitan-Vickers Electrical Co., Ltd. (£810). Transformers, Brush Electrical Engineering Co., Ltd. (£720).

Ilford.—Electricity Committee. Recommended. Cable contract extension for twelve months.—Metropolitan Electric Cable & Construction Co., Ltd.

London.—POPLAR.—Electricity Committee. Recommended. Neon signs at showrooms (£223).—Maple & Co.

Baths Committee. Recommended. Electrically driven drying machine (£550).—Lister Bros.

STEPNEY.—Electricity Supply Committee. Recommended. Switches (£187).—General Electric Co., Ltd. Plugs (£137) and teak distribution boards.—P. L. Dwyer & Co. House-service cut-outs (£1,551).—W. T. Henley's Telegraph Works Co., Ltd.

Middlesbrough.—Town Council. Accepted. Electric lighting at the new Brambles Council school.—H. G. Sproats & Co.

South Africa.—CAPETOWN.—Electricity Committee. Accepted. Electrical work and installation of electric clocks at sanatorium.—R. Darbyshire, Ltd.—Ranges.—British General Electric Co., Ltd. (£715).—Newman, Ltd. (£313); C. E. Scott, Ltd. (£287). Switchgear (£15,320).—A. Reyrolle & Co., Ltd. Cables.—Dobson & Behr, Ltd. (£1,260); Hubert Davies & Co., Ltd. (£1,910); Siemens Bros. & Co. (British), Ltd. (£2,394); Trevor Williams & Co. (£6,872); British Insulated Cables, Ltd. (£579). Pillar boxes (£10 15s. each).—Consani's Engineering, Ltd. Unbreakable fuses (£567).—Saaler & Roberts. Street-lighting fittings and spares (£391).—Davis & Soper, Ltd.

Stirlingshire.—County Council. Accepted. Electric lighting at the Milton of Campsie housing scheme.—T. Kilpatrick.

Wallasey.—Health Committee. Accepted. X-ray apparatus (£544).—Solus Electrical Co.

Forthcoming Events

Electrical Power Engineers' Association (*London Local Group*).—Monday, February 4th, Caxton Hall, S.W.1, 7.15 p.m. "The Multiple-Retort Gravity Underfeed Stoker." Mr. W. M. Dodds.

Northampton Past Day Students' Association (*Old N'ions*).—Monday, February 4th. Cock Tavern, Fleet Street, E.C.4. 6.30 for 7 p.m. Annual supper.

Association of Mining Electrical Engineers.—Tuesday, February 5th. Junior Institution of Engineers, S.W.1. 6.30 p.m. "Some Experiments in Wireless Signalling Underground." Mr. C. H. Roddis (*Kent Sub-Branch*).—Saturday, February 2nd, Technical Institute, Dover, 6.30 p.m. Paper by Mr. A. R. Cooper. (*South Wales Branch*).—Saturday, February 2nd. Connaught Rooms (Cox's), Cardiff. 6.30 for 7 p.m. Annual dinner. (*West Wales Branch*).—Saturday, February 2nd. Y.M.C.A., Swansea. "Deep Well Pumps and Colliery Drainage." Mr. R. E. Fortune.

Illuminating Engineering Society.—Tuesday, February 5th. Trocadero Restaurant, W.1. 7 for 7.30 p.m. Annual dinner.

Institution of Civil Engineers.—Tuesday, February 5th. Institution, London. 6 p.m. Papers on engineering works at power stations by Messrs. W. M. Anderson and others.

Institution of Electrical Engineers.—Thursday, February 7th. Grosvenor House, W.1. 7 for 7.30 p.m. Annual dinner. (*Meter and Instrument Section*).—Friday, February 1st. Institution, London. 7 p.m. "A Study of the Induction Watt-Hour Meter." Mr. T. Havekin. (*North-Eastern Centre*).—Friday, February 1st. Grand Assembly Rooms, Newcastle-upon Tyne. 7 for 7.30 p.m. Annual dinner and dance. (*Sheffield Sub-Centre*).—Friday, February 1st. Royal Victoria Hotel, Sheffield. Annual supper-dance. (*North-Western Students' Section*).—Saturday, February 2nd. 1.30 p.m. Visit to the "Cronton" colliery, near Prescot. (*Scottish Centre*).—Saturday, February 2nd. Grand Hotel, Glasgow. Smoking concert. Tuesday, February 5th. 39, Elmbank Crescent, Glasgow. 7.30 p.m. "The Electrical Development of Northern Ireland." Mr. C. R. Westlake. (*North-Eastern Students' Section*).—Sunday, February 3rd. 11 a.m. Visit to the Paramount Theatre, Newcastle-upon-Tyne. (*North Midland Students' Section*).—Sunday, February 3rd. 10.50 a.m. Visit to the Paramount Picture Theatre, Leeds. (*South Midland Centre*).—Monday, February 4th. James Watt Memorial Institute, Birmingham. 7 p.m. Paper by Mr. C. R. Westlake. (*East Midland Sub-Centre*).—Tuesday, February 5th. The College, Loughborough. 6.45 p.m. "Problems of Supply and Distribution over a Large Area and Suggested Solutions." Mr. W. Burton. (*North Midland Centre*).—Tuesday, February 5th. Hotel Metropole, Leeds. 7 p.m. "Hydro-Electric Development in Great Britain." Messrs. A. S. Valentine and E. M. Bergstrom. (*North-Western Centre*).—Tuesday, February 5th. Engineers' Club, Manchester. 7.15 p.m. "Private Plants and Public Supply Tariffs." Mr. J. A. Sumner. (*Wireless Section*).—Wednesday, February 6th. Institution, London. 6 p.m. "Continuously Evacuated Valves and their Associated Equipment." Messrs. C. R. Burch and C. Sykes.

Bristol Electric Club.—Friday, February 8th. Royal Hotel, Bristol. 7.45 p.m. Programme to be arranged by Mr. A. L. Davis.

Electrical Trades Commercial Travellers' Association.—Friday, February 8th. Connaught Rooms, W.C. 6.30 for 7 p.m. Annual dinner.

Notes

Jubilee Floodlighting Plans

Mr. Ormsby-Gore, First Commissioner of Works, stated in the House of Commons on January 29th that provisional arrangements had been made to floodlight certain public buildings in connection with the Jubilee celebrations in May. These would include Buckingham Palace, St. James's Palace, the Admiralty and Horse Guards Arches, the clock tower of the Houses of Parliament, the National Gallery, the London County Hall, and Westminster Abbey. He stated that almost the entire cost of floodlighting these buildings, together with St. James's Park, would be borne by the electricity and gas industries, and he was hopeful that a number of other buildings in public and private ownership might also be floodlighted. A number of hotels, stores and other private buildings in the West End, and the flower beds in St. James's Park, are also to be illuminated.

Lubrication Research

Some of the difficulties of deducing the properties of a lubricating oil from tests on a bulk sample are brought out in a technical paper issued by the Department of Scientific and Industrial Research ("A Study of the Boundary Lubricating Value of Mineral Oils of Different Origin," by Miss M. E. Nottage; Stationery Office, 9d. net). The report deals with the conditions that exist just before seizing between moving parts takes place when the film of lubricating oil between two smooth bearing surfaces is so thin that the molecules on the outermost layer of one surface are within the range of the cohesive forces due to the outermost molecules on the other surface. Such boundary conditions become important when starting or stopping an engine, when the friction, it is stated, may be as much as 100 times as great as when the surfaces are separated by a fairly thick film of oil.

Mine Gas Detector Rules

The Mines Department has issued draft general regulations which the Board of Trade proposes in due course to enforce relating to the provision of firedamp detectors for use in coal mines. It is proposed that every detector shall be of a type approved by the Board of Trade and the number to be provided for use shall not be less than in the proportion of one detector, in longwall workings for every eight, and in other workings every four, of the total number of persons who are wholly or mainly employed at the working faces; and there shall be a detector in use with each electric coal-cutting machine and electric drill when working. In place of the safety lamp required in certain circumstances to be used with electric motors there may be used a detector of any approved type for that purpose. An explanatory circular states that the desirability of providing means to enable workmen in or about the working faces to supplement the tests for safety of the atmosphere which are made from time to time by the deputies and other officials was created through the displacement of the flame safety lamp by the electric safety lamp. It was studied in 1922 by the Miners' Lamps Committee and the general regulations recently made to secure improved lighting, which involve the replacement of a large proportion of the safety lamps hitherto in use at and about the coal face by lamps of higher candle power, have an important bearing on the problem. Objections to the proposed regulations may be submitted to the Secretary for Mines not later than March 7th next.

Australian Invitation to the British Association

The Melbourne correspondent of *The Times* reports that a proposal to invite the British Association to Australia in 1938 was made at the recent Australasian Science Congress, and was referred to the Executive.

Old, but Useful

In connection with the recent correspondence on methods employed in the early days of electricity supply, our attention has been drawn to a note in the Journal of the Association of "Old Cromptonians." This relates to the use of a dog, "Miss Strip," in connection with the drawing-in of the bare copper mains laid by Crompton's in those times. The conductors were laid in watertight concrete culverts covered with York stone and supported by and strained against insulators. Inspection, insulation and joint boxes were placed at intervals of 15 yd. and straining points at every 100 yd. "Miss Strip" was appointed to the mains-laying staff in 1889 and her duty was to carry a feed line, attached to her collar, through the culverts between the straining boxes. She took part in the laying of many miles of cable.

Appointments Vacant

Assistant mains engineer and meter mechanic for Poplar Electricity Department.

Wiremen for Rugby Electricity Department.

Chief showroom assistant, lady demonstrator and a meter mechanic for Brighton Electricity Department.

Temporary mains assistant for Dover Electricity Department.

Borough electrical engineer for Congleton Corporation (commencing salary £300 per annum).

Makers' Names Wanted

KEYSTONE vacuum cleaner.
CAPSTAN copper lantern.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. A. D. Pluck, A.M.I.E.E., engineer and manager of the Congleton Corporation Electricity Department, has been recommended by the Hazel Grove and Bramhall Electricity Committee for the position of engineer and manager to the Hazel Grove undertaking in succession to the late Mr. R. Lomax. Mr. H. Pedley was appointed acting manager of the undertaking after the death of Mr. Lomax, and has held the position since.

Mr. A. W. Beuttell, M.I.E.E., has been elected president of Faraday House Old Students' Association for the current year. He is governing director of Linolite, Ltd., and a director of Ozonair, Ltd. The vice-presidents of the Association are Messrs. A. H. Bennett, M.I.E.E., and L. H. Short, M.C., A.M.Inst.T., and the members of the Council are Messrs. E. A. Corbin, M.I.E.E., C. H. P. Ewbank, R. G. Sankey, and M. Vines.

[Lafayette, Ltd.

Mr. A. W. Beuttell

Mr. A. E. Strong has been appointed engineering and distribution assistant to the Wolverhampton Corporation Electricity Department. For the past ten years he has been with the Leicestershire and Warwickshire Electric Power Co., Hinckley, and during the greater part of this period was assistant mains engineer. He holds a B.Sc. Engineering (Lond.) degree, and is an associate member of the Institutions of Civil and Electrical Engineers.

Sir Felix Pole, who has completed a mission entrusted to him by the Palestine Government, left Jerusalem for London on Saturday last, according to a *Reuter* message. He was asked to investigate a proposal to divert the main line of the Palestine Railways, so as to pass near Jaffa and Tel-Aviv.

Mr. H. E. Gott, who has had a wide experience in the service of Cable & Wireless, Ltd., in many parts of the world, has been appointed divisional manager for the United Kingdom and has now taken up his duties. He entered the service of the old Eastern Telegraph Co. as a probationer, and has served at home and abroad for over thirty years.

Mr. T. L. Price has been elected a director of Messrs. Blackstone & Co., Ltd. He served his apprenticeship, from 1869-73, with Mellards Trent Foundry Co., Rugeley, and in the latter year joined Messrs. Corbett & Peele, of Shrewsbury, with whom he remained until 1884, when he was appointed sales representative for the British Isles for Messrs. Jeffrey & Blackstone, who were registered as Blackstone & Co., Ltd., in 1889. He has been responsible for the sale of over 30,000 Blackstone oil engines as well as for the development of the sales of the earlier products of the company, which were principally machines for agricultural purposes. He became home sales manager of the company in 1924, and in 1930 received a presentation from his principals and colleagues to commemorate his sixtieth year of attendance at consecutive Royal Shows. He is a vice-president of the Agricultural Engineering Benevolent Association, of which he was one of the founders, and was chairman for several years.

Mr. T. L. Price

Dr. F. B. Jewett, of New York, has been awarded the 1935 Faraday Medal by the Institution of Electrical Engineers, of which he has been a member since 1922. Dr. Jewett is one of the leading American authorities on telegraph and telephone communication, and received the Edison Medal in 1929.

Dr. Ludwig Dreyfus, one of the engineers of the Swedish Asea Co., of Vesteras, has recently been awarded the Cedergren Medal in gold by the directors of the Royal Technical Institute of Sweden. The medal was instituted in 1908 and is awarded once every five years for important contributions to electro-technical literature. The first to receive the medal was Dr. Steinmetz, to whom it was awarded in 1914. Since then it has been awarded to Professor K. W. Wagner, Oliver Heaviside, and Professor H. Pleijel.

Mr. V. H. Vale, of the General Electric Co., Ltd., assists Mr. George Lansbury, M.P., to complete a form for an electric cooker in the presence of Mr. R. Illingworth, borough electrical engineer of Poplar, at a recent demonstration **(see page 160)**

Mr. A. Vivian, a member of the staff of Holman Bros., Camborne, has been appointed by the Consett Iron Co., Ltd. as assistant electrical engineer at the Consett group of collieries.

Lord Gainford has been elected president of the Radio Manufacturers' Association in succession to Lt.-Col. Moore-Brabazon, M.P. Lord Gainford was chairman of the original B.B.C., and later became vice-chairman of the Corporation.

Mr. A. Hudson is leaving the Bangor section of the North Wales Post Office to take up duty as sectional engineer in the Birmingham External Section after two and a half years at Bangor, and at a recent farewell gathering Mr. Green (Sectional Engineer) presented him with a cinema camera on behalf of the staff.

Major R. L. Benson, of Messrs. Robert Benson & Co., has joined the boards of the International Automatic Telephone Co., and the Telephone & General Trust, Ltd.

Mr. J. M. Barnicot, formerly of the General Electric Co., Ltd. (Illuminating Engineering Department), has been appointed illuminating engineer to Messrs. Osler & Faraday, Ltd., as from January 1st. Mr. Barnicot has been associated with the design of some of the most ambitious floodlighting enterprises, notably during the International Illumination Convention and Faraday Centenary Celebrations of 1931, and his knowledge and experience of many aspects of lighting should be of considerable value to Messrs. Osler & Faraday, Ltd., in the new departure which they are making in adapting their work to modern requirements.

[Photomaton

Mr. J. M. Barnicot

Lord Hirst, the chairman of the General Electric Co., Ltd., has been elected an honorary member of the Institution of Electrical Engineers. The announcement was made at last week's ordinary meeting of the Institution by the President (Prof. W. M. Thornton). Lord Hirst was elected an associate member of the I.E.E. in 1888, and became a full member ten years later. He has served on the Council.

Mr. E. Morgan, electrical engineer and manager of the Sheffield Corporation Electric Supply Department, who is leaving shortly to join the Shropshire, Worcestershire & Staffordshire Electric Supply Co., was presented with a gold watch and chain at a recent function held in connection with

the Sports Club. The presentation was made by Mr. F. A. Dear, secretary of the Department, on behalf of the staff. Mr. Morgan, in expressing thanks for the gift, paid a tribute to all the staff and to Councillor Longden, chairman of the Electricity Committee.

Mr. C. Turnbull, borough electrical engineer, Tynemouth, is to retire on superannuation in June next.

Mr. J. H. Asdell is the president of the Birmingham Electric Club for the ensuing year. He delivered his presidential address on "Engineering and Civilisation—the Future" on Friday last.

Mr. A. W. T. Boyd, B.Sc., who is with the General Electric Co., Ltd., at Coventry, has been appointed lecturer in electrical engineering at the North Staffordshire Technical College in succession to Dr. E. G. Ashton, who has been appointed a lecturer at Rotherham Technical College.

Prof. Ing. Ernst Zehme, who has been for many years the editor-in-chief of the *Elektrotechnische Zeitschrift*, retired on January 1st this year. He joined the staff of the paper thirty years ago, coming from Siemens Schuckert, of Nürnberg. His successor is **Dr. Ing. H. Müller,** an expert in high-voltage technique.

Obituary

Mr. F. Douglas-Watson.—The death has occurred in a Glasgow nursing home of Mr. Francis Douglas-Watson, late managing director of the Constantinople Telephone Co. Mr. Douglas-Watson was Scottish manager for the National Telephone Co. until it was taken over by the Government, and was later appointed by the Turkish Government to organise the telephone system in Turkey. He retired recently and resided near Killearn, Stirlingshire. He was sixty-nine years of age.

Mr. F. C. Lovelock.—The death is reported from Sydney, New South Wales, of Mr. F. C. Lovelock, who was for over twenty-nine years associated with the electrical industry in that State. For twenty-five years he was sales manager to Messrs. Warburton, Franki, Ltd., electrical engineers and merchants. He was forty-two years of age and two years ago established F. C. Lovelock & Co., Ltd., refrigeration supply engineers.

Mr. A. McC. McLuckie.—The death has occurred, at the age of sixty-eight, at Brightons, Polmont, Stirlingshire, of Mr. Alexander McCulloch McLuckie, formerly chief electrician at Nobel's Regent Factory. He was in the employment of Nobel's Explosives Co., Ltd., for fifty years, and retired in 1931. Mr. McLuckie was responsible for the electrical installation at the Regent Factory, and many new improvements were carried out later.

Mons. H. Galey.—The death recently occurred in Paris at the age of sixty-two years of M. Henri Galey, honorary president of the French Chambre Syndicale des Entrepreneurs et Constructeurs Electriciens.

Mr. E. G. Rattue.—The death is announced at the age of fifty-four years of Mr. Ernest George Rattue, chief accountant and assistant secretary of the Salisbury Electric Light & Supply Co., Ltd. He was also secretary of the Wilton Electric Supply Co., Ltd.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Acratone Radio, Ltd.—Private company. Registered in Edinburgh January 19th. Capital, £100 in 10s. shares. Objects: To carry on the business of wireless engineers, repairers and manufacturers of, dealers in, and agents for wireless receiving sets, televisors, &c. The directors are: R. A. Luth, 490, Paisley Road, Glasgow, C.5, and J. C. Kerr, 115, St. Vincent Street, Glasgow. Registered office: 115, St. Vincent Street, Glasgow.

Coastal Radio, Ltd.—Private company. Registered January 23rd in Edinburgh. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in radio-telephone and telegraph apparatus, &c. The subscribers are: H. J. Johannesen, Polarys, Ash Tree Avenue, Grimsby, and A. Redpath, 103, Brunswick Street, Edinburgh.

H. & J. Radio, Ltd.—Private company. Registered January 24th. Capital, £500 in £1 shares. Objects: To carry on the business of radio and electrical dealers, distributors of wireless sets and parts, batteries, valves, &c. The directors are: J. H. White, 2, Copenhagen Place, E.14, and Miss I. Nelson, 83, Bromley Street, E.1. Registered office: 544, Commercial Road, E.1.

Refrigerator Distributors, Ltd.—Private company. Registered January 24th. Capital, £2,000 in 1,950 ordinary shares of £1 each and 1,000 deferred shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in freezing and cold storage rooms, stores and chambers of all kinds, ice safes, refrigerators and freezing machines, ice makers, &c. The subscribers are: F. Jones and Mrs. Ethel M. L. Jones, both of 12, Gildridge Road, Whalley Range, Manchester. F. Jones signs documents as director. Registered office: 9, Cateaton Street, Manchester.

Ferguson Radio Corporation, Ltd.—Private company. Registered January 21st. Capital, £100 in £1 shares. Objects: To carry on business as importers, exporters and manufacturers of and dealers in all classes of goods and merchandise, &c. The permanent directors are: W. W. Dowding (chairman), 27, Ashley Place, S.W.1, and G. Mayle, 44, Ennerdale Road, Richmond, Surrey. Registered office: 25/7, Oxford Street, W.1.

Hinton Patents, Ltd.—Public company. Registered January 21st. Nominal capital, £7,000 in 5s. shares. Objects: To acquire from T. W. Hinton all his rights and interests in the revenue of a telephone invention, known as "an automatic call-recording system" for use with dial telephone systems. The first directors are: T. W. Hinton, 1, St. Andrew's Place, Cardiff, and three others. Registered office: 1, St. Andrew's Place, Cardiff.

Reliance Lamp Co., Ltd.—Private company. Registered January 19th. Capital, £1,200 in £1 shares. Objects: To acquire the business of lamp manufacturers and dealers carried on by K. A. Hillyers and J. Merrifield, and to carry on the business of manufacturers of, dealers in, and repairers of electrical accumulators, batteries, dynamos, motors, wireless transmitting and receiving sets, &c. The first directors are: K. A. Hillyers, 14, Ivy Road, N.W.2, and J. A. Tassie, South Lodge, Cobham. Registered office: 14, Ivy Road, N.W.2.

Oriental Hydro-Electric Syndicate, Ltd.—Private company. Registered January 22nd. Nominal capital, £3,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, producers and suppliers of electricity, manufacturers of and dealers in railway, tramway, electric, magnetic, galvanic and other apparatus; to acquire concessions, grants, claims, licences, leases and options, for any hydro-electric or mining objects, &c., in any part of the world. The subscribers are: D. F. Campbell, 17, Victoria Street, S.W.1, and W. S. Gifford, 231, Cromwell Road, S.W.5. Registered office: 17, Victoria Street, S.W.1.

Kego Electric Co., Ltd.—Private company. Registered January 25th. Capital, £2,000 in £1 shares. Objects: To carry on the business of general merchants and manufacturers of and dealers in electric lighting fittings, &c. The subscribers are: J. Keller, West Lodge Works, The Green, Ealing, W.5; and P. J. Joynes, 4, The Grove, Hammersmith, W.6. Secretary: C. L. H. Martin, 9, Belgrave Road, S.W.1.

Appliances Finance, Ltd.—Private company. Registered January 26th. Capital, £500 in £1 shares. Objects: To carry on the business of radio and television engineers, garage proprietors, manufacturers of and dealers in lamps, electrical measuring instruments, wire, &c. The subscribers are: H. E. Simpson, 15, Graver Lane, Clayton Bridge, Manchester, 10; and Phyllis M. Lawton, Ingleside, Cranworth Street, Stalybridge. Solicitors: J. Prior, 7, Brazennose Street, Manchester.

Acton Tool & Engineering Co., Ltd.—Private company. Registered January 17th. Capital, £4,000 in 4,000 ordinary shares of 5s. each and 3,000 7½ per cent. cumulative preference shares of £1 each. Objects: To adopt an agreement with John H. Cowell, and to carry on the business of special and press tool manufacturers, general mechanical and electrical engineers, &c. The directors are: J. H. Cowell (managing director) and Robt. H. Cowell, both of 9, Hillcroft Crescent, Wembley, Middlesex. Registered office: Standard Road, Park Royal, N.W.10.

Returns of Electrical Companies

North Wales Power Co., Ltd.—Issue on February 1st, 1927, of £200,000 debentures, part of a series already registered. (Particulars of issue filed January 15th, 1935.)

Satisfaction on December 5th, 1934, of trust deed dated May 12th, 1924, and registered May 16th, 1924. (According to the register of mortgages, the trust deed registered May 16th, 1924, originally secured £1,700,000.)

Electricity Distribution of North Wales & District, Ltd.—Satisfaction on December 31st, 1934, of charge dated June 1st, 1932, and registered June 2nd, 1932.

London Power Co., Ltd.—Particulars have been filed of debenture stock to secure £1,000,000, authorised January 11th, 1935, and covered by trust deed of same date, constituting a floating charge on the undertaking, assets and revenues of the company, present and future. The whole amount is now issued. The company has power to increase the principal amount of the stock by supplemental deed. Trustees: Law Debenture Corporation, Ltd.

Applied Processes, Ltd.—Particulars filed on January 16th, 1935, of £1,200 debentures, authorised November 29th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Litholite Insulators & St. Albans Mouldings, Ltd.—(a) Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated December 31st, 1934, and (b) deposit on same date of deeds of freehold factory, Sandown Road, Watford, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Express Engineering Co., Ltd.—Satisfaction in full on November 16th, 1934, of debenture in favour of Branch Nominees, Ltd., dated July 2nd, 1932, and registered July 15th, 1932, securing £500.

Radio & Electrical Equipment Renters, Ltd.—Debenture dated January 3rd, 1935, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Transport Investment Trust, Ltd., 32, Finsbury Square, E.C.2.

Bennie Lifts, Ltd.—Satisfaction in full on January 11th, 1935, of 2nd debentures authorised by resolution dated January 16th, 1934, and registered January 23rd, 1934. (According to the register of mortgages, the debentures registered January 23rd, 1934, originally secured £1,000.)

Radio Furniture & Fittings, Ltd.—The nominal capital has been increased by the addition of £6,000 beyond the registered capital of £2,050. The additional capital is divided into 6,000 7 per cent. non-cumulative preference shares of £1.

British Radio Relay Service, Ltd.—The nominal capital has been increased by the addition of £12,000 beyond the registered capital of £8,000. The additional capital is divided into 11,000 ordinary shares of £1 and 20,000 ordinary shares of 1s. This increase is for the purpose of taking over the undertaking and assets of Nuvolian Electrics, Ltd.

Somerby Electric Light Co., Ltd.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £1,000.

Harry's Wireless Service, Ltd.—J. Ridehalgh, 15, Canterbury Street, Blackburn, was appointed receiver and manager on January 18th, 1935, under powers contained in debentures dated April 19th, 1934.

Corwen Electric Light Co., Ltd.—Capital, £2,000 in £1 shares. Return dated November 6th, 1934. 1,610 shares taken up. £1,610 paid. Mortgages and charges nil.

Curtis Manufacturing Co., Ltd.—Capital, £6,000 in £1 shares. Return dated September 7th (filed December 5th), 1934. All shares taken up. £1,000 paid, £5,000 considered as paid. Mortgages and charges nil.

Devereux, Moodie & Co., Ltd.—Capital, £5,000 in 2,500 preference and 2,500 ordinary shares of £1. Return dated December 17th, 1934. 1,900 preference and 1,001 ordinary shares taken up. £2,901 paid. Mortgages and charges nil.

C. J. Plucknett & Co., Ltd.—Capital, £20,000 in £1 shares. Return dated December 28th, 1934. 15,007 shares taken up. £7 paid, £15,000 considered as paid. Mortgages and charges: £3,000.

Electroway Heaters, Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 shares beyond the registered capital of £2,000.

Union Radio Co., Ltd.—The nominal capital has been increased by the addition of £4,000 beyond the registered capital of £1,000. The additional capital is divided into 500 ordinary and 3,500 redeemable cumulative participating 5 per cent. preference shares of £1.

Plymouth Rediffusion Service, Ltd.—The nominal capital has been increased by the addition of £4,000 beyond the registered capital of £1,000. The additional capital is divided into 80,000 ordinary shares of 1s. Each of the 1,000 shares of £1 in the original capital has been sub-divided into 20 shares of 1s. each.

General Electric Co., Ltd.—The nominal capital has been increased by the addition of £2,000,000 in £1 ordinary shares beyond the registered capital of £7,600,000.

Streamline Radio, Ltd.—Particulars filed of debentures not exceeding £2,500 (including £500 already registered), authorised January 14th, 1935, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £2,000.

Enfield Rolling Mills, Ltd.—Particulars have been filed of debenture stock to secure £200,000, and a premium not exceeding 2 per cent., in certain events, authorised December 21st, 1934, and covered by trust deed dated January 8th, 1935, the whole amount being now issued. Property charged: Freehold and leasehold properties, &c., at Brimsdown, Enfield and London, and the company's undertaking and other property, present and future, including uncalled capital. Trustees: English & Caldeonian Investment Co., Ltd.

Plymouth Rediffusion Service, Ltd.—Particulars have been filed for debenture stock to secure £50,000, and a premium not exceeding 24 per cent., authorised January 8th, 1935, and covered by trust deed dated January 10th, 1935, charged on the company's undertaking, assets and property, including any uncalled capital, the whole amount being now issued. Trustees: Hoare Trustees, 37, Fleet Street, E.C.4.

Lancashire Electric Sign Construction Co., Ltd.—Wm. K. Blownley, Litherland Road, Sale, Ches., was appointed receiver and manager on December 29th, 1934, under powers contained in debentures dated June 18th, 1931, and September 29th, 1932. (Notice filed January 24th, 1935.)

C. & R. Research, Ltd.—The nominal capital has been increased by the addition of £1,515 beyond the registered capital of £510. The additional capital is divided into 1,000 8 per cent. cumulative first preference shares of £1 each, 510 second preference shares of £1 each, and 100 ordinary shares of 1s. each. The second preference shares rank, *pari passu*, with existing preference shares (hereafter to be known as "second preference" shares).

Buchanan & Curwen, Ltd.—Capital, £15,000 in 11,000 6 per cent. preference and 4,000 ordinary shares of £1. Return dated December 14th, 1934. 9,000 preference and 3,100 ordinary shares taken up. £2,100 paid. £10,000 considered as paid. Mortgages and charges, £750.

H. P. Electrical Co., Ltd.—Capital, £1,000 in £1 shares. Return dated October 16th (filed November 19th), 1934. 654 shares taken up. £654 paid. Mortgages and charges, nil.

Dean & Noble, Ltd.—Capital, £1,000 in £1 shares. Return dated December 24th, 1934. All shares taken up. £1,000 considered as paid. Mortgages and charges, nil.

Hume Atkins & Co., Ltd.—Capital, £6,500 in £1 shares. Return dated December 29th, 1934. All shares taken up. £6,500 paid. Mortgages and charges, £2,800.

W. Monks & Co., Ltd.—Capital, £1,500 in £1 shares. Return dated December 29th, 1934. All shares taken up. £750 paid. £750 considered as paid. Mortgages and charges, nil.

Metropolitan Rediffusion Services, Ltd.—Issue on January 18th, 1935, of £300 debentures, part of a series already registered.

City Notes

The Singapore Traction Co., Ltd., reports a profit of £25,032 for the year ended September 30th last, after providing for debenture interest and London expenses, as compared with £29,830 in the preceding year, which, with £5,777 brought in, makes £30,809 available. Appropriations totalling £26,513 have been made for debenture stock redemption, depreciation and renewals and taxation, leaving a balance of £4,295, which is carried forward. The arrears of dividend on the preference shares now amount to 25 per cent. Traffic receipts and operating profits continued to fall off during the first quarter of the financial year, but the decline was arrested in January, 1934, and gross receipts were largely augmented last month by the abolition of licences for all seven-seater motor-buses on certain routes by the Municipal Commissioners. The negotiations with the Shanghai Electric Construction Co., Ltd., with a view to the release of this company from the management agreement, the cancellation of the Shanghai Co.'s participation in the profits and (on a winding-up) in surplus assets, and the abrogation of its special voting rights have now reached the stage when an offer to buy out the Shanghai Co.'s rights for £100,000 in cash has been accepted, subject to the formal sanctions and to legislation in the Straits Settlements. Meeting: February 13th in London.

J. & E. Hall, Ltd., report a net profit for the year ended September 30th last of £14,490, as compared with a loss of £4,858 in the preceding year. To this is added £5,171 brought in, making £19,661. The ordinary dividend is 2½ per cent. (against nil), and £1,251 is carried forward.

The Quebec Power Co. has announced a dividend of 25 cents on the common shares for the quarter ended December 31st last (same).

J. & F. Stone Lighting & Radio has declared an interim dividend of 5 per cent. for the half-year to December 31st last.

The City of Buenos Ayres Tramways Co. (1904), Ltd., has announced the usual quarterly dividend of 1¼ per cent.

The Mersey Railway Co. announces a dividend of ¾ per cent. on the ordinary stock for 1934, as against ½ per cent. for 1933.

German Companies.—A *Reuter* report from Berlin states that for the first time in four years a profit for the Siemens-Schuckert Co. is shown in the annual report of the Siemens electrical group. The whole of the profit, which amounts to Rm. 1,323,058, is to be transferred to reserve.

The Siemens & Halske concern reports a profit of Rm. 6,863,563 (£571,964), in addition to Rm. 2,764,419 (£230,368) carried forward from last year. A dividend of 7 per cent. is recommended, while Rm. 3,366,337 (£280,528) is to be carried forward.

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets show a mild degree of hesitation, and the demand for gilt-edged securities is not quite so insistent as of late. It is not so much a vague talk of money becoming more expensive towards the autumn which has produced the halt to the forward movement: more to the point is the uncertainty produced by the United States in connection with what has now come to be known as the Gold Clause case. The doubt, which is due to be set at rest by a vote of Congress next Monday, February 4th, is proving sufficient to lay a restraint upon enterprise, investment and speculation. The ordinary shares of the Home electricity supply companies hold their prices very well, but the advance in the stocks of the public boards is checked. Movements in the stocks and shares of the manufacturing companies are equally balanced between rises and falls.

Public Boards

The gains secured last week by the fixed-interest stocks in the Central Electricity and the London Passenger Transport groups have all been held. The market for Transport "C" stock has been jumpy and erratic. The price has shed 3 points, falling back to 92. Some people are buying Metropolitan Surplus Land stock, which yields a little over 3 per cent. on the money. Holders of the stock have several alternatives, and they will not be called upon to exercise or to make their final choice for some time to come. Amongst Central Electricity stocks, that which gives the best yield at the present time is the 5 per cent. issue dated March 1950-1970. Of this there is £2,000 on offer at 119, returning 4¼ per cent. now, and, allowing for redemption at the earlier of the two dates quoted, 3¾ per cent. Interest is due in March and September, the present price carrying, therefore, five months' dividend. Of the recently issued Central Electricity 3¼ per cent. stock, on which a first dividend of £1 per cent. is due in May next, there is £25,000 on offer in the market at 97½ free of stamp. The stock is dated 1974-1994. It yields, at the present price, £3 6s. 6d. per cent., and assuming repayment at 100 in 1994, the yield will be £3 7s. 3d. per cent. This stock is a shade cheaper than the new London and Home Counties 3¼ per cent., on which the first dividend of £1 per cent. falls due in June. This is dated 1955-1975, and at 101¼, the price at which stock can be bought, the return, both for the running yield and the redemption return, is £3 4s. 9d. per cent.

"Non-Trustee"

These stocks stand outside the scope of the Trustee Act, although, as it has been pointed out here on several previous occasions, the security is good enough to warrant the Trustee List being widened to permit inclusion of these electricity

board securities within its bounds. Scottish investors may be interested to know that there is £1,300 Ayrshire Electricity Board 4½ per cent. stock to be obtained at 114½. The issue is dated 1945-1955; and, if repayment takes place at the earlier of the two years mentioned, the income becomes reduced to 3 per cent.

Electricity Supply Shares

Metropolitan Electric ordinary shares have improved 6d. to 56s.; North Metropolitans at 64s. 6d. are 6d. lower. For Clyde Valley there was a demand which, coming on a market ill supplied with stock, served to put up the price 1s. to 43s. 6d. Lancashire Light and Power are better at £2. The forthcoming redemption of the Whitehall Electric debentures served further to stiffen the price of the preference shares, which, on top of their last week's gain of 5s., are 9d. higher at 28s. 3d. At this latter price the return is still the useful amount of £5 6s. 2d. per cent.

By comparison with the yields to be obtained from Central Electricity and other public boards' stocks, the income from the ordinary shares of the London electricity supply companies makes interesting reading. There are at the present time amounts ranging from 1,000 to 4,000 ordinary shares in the Brompton & Kensington, City of London, London Electric, St. James' and South London companies, offered at prices giving returns, on the basis of the last-paid dividends, of an average which works out to £3 16s. 6d. per cent. Of the shares offered, the St. James', of which 4,000 are to be obtained, give the best yield, namely, £3 18s. 3d. per cent., while Londons at 37s. afford 3¾ per cent. It will be noticed that the five companies mentioned are all operated under the London Electricity Supply Act of 1925.

Forthcoming Dividends

The St. James' and the City of London companies both paid 7½ per cent. on their ordinary shares for the year ended 1933, and are expected to repeat this rate for the year just finished; the other companies paid the standard rate of 7 per cent. in the former year, and there would be no disappointment if they and the London undertakings which paid 7 per cent. for 1933 did not advance their dividends due for declaration next month. That the companies have done very well is likely to be demonstrated by the accounts. Passing reference may be made to disappointment caused in the gas share market by the reduction in the dividend on South Metropolitan Gas ordinary stock, which came down from 6 per cent. to 53s. 4d. per cent. less in consequence, it is understood, of the mild weather experienced during 1934. The Gas Light & Coke Company has declared its regular rate of £5 12s. for 1934.

The provincial electricity supply companies, like those of the Scottish undertakings, are making energetic headway in the steady expansion in national trade, of which fresh evidence is afforded practically every week.

Cables and Wireless

Cables and Wireless preference stock keeps steady at 84½. The two ordinary stocks have gone back in sympathy with other speculative descriptions. Financial troubles are said to have arisen in certain directions, which, although having nothing to do with industrial stocks and shares, yet exert an indirect effect through the repercussion which difficulties of this nature usually cause. Great Northern Telegraphs are 10s. higher at 38½. The Anglo-American group is firm. Amongst dollar stocks, American Telephone and Telegraph common is quoted at 108¼, International at 9¾. Brazilian Tractions have dipped into what are called single figures at 9⅞.

Manufacturing and Equipment

General Electric ordinary have recovered to 49s. 6d., after their recent reaction. Crompton Parkinsons have reached the round £2. Henleys are 3s. 9d. up at £7. There has been provincial buying of Electric Construction shares, raising the price to 17s. 6d. The argument in their favour is that the shares are of that nature which makes appeal to the buyer who is not particular as to the obtaining of immediate income, but prefers something which is likely to show him capital appreciation in the future.

India-Rubber preferred have improved to 22s. 6d.; Telegraph Constructions and Siemens, running level, show 1/16 fall. Enfield Rolling Mills debenture holds its premium of 1¼. The shares, however, are lower at 5¾. Siemens preference at 39s. 6d. are a shilling up. Hall's Telephone shares strengthened to £1, and Telephone Manufacturing (1929) to 4s. 3d.

Miscellaneous Matters

Perak River Hydro-electric 7 per cent. debenture has shot up from 50 to 56; stock changed hands on Tuesday in this week at 58. Tokyo Electric sixes, after being 82, reverted to 81. British Electric Traction deferred, whose vitality nothing seems to quench, is 25 points higher, and is now close upon the heels of £1,000 for £100 stock. Victoria Falls are 1/16 lower on account of the dullness in South African shares generally. A line of ten thousand Yorkshire (West Riding) Electric Tramways 6 per cent. preference came to market at 26s. 10½d., yielding at this price 4 7/16 per cent. on the money. The next dividend payment is due in July. The last published report showed £39,000 available to meet the £11,000 required for the annual dividend on this issue. Iron and steel shares make a somewhat mixed showing. The rubber market softly slumbers.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Jan. 29.	Rise or Fall.	Yield. £ s.	Yield. p.c. d.
HOME ELECTRICITY COMPANIES.							
Bournemouth and Poole	1	15	15	79/6	—	3 15	5
Brompton Ordinary	1	7	7	36/–	—	3 17	9
Charing Cross Ordinary	1	7	7	36/–	—	3 17	9
Chelsea	1	7	7	36/–	—	3 17	9
City of London	1	7½	7½	38/6	—	3 18	0
Clyde Valley	1	7	7	43/6	+1	3 4	3
County of London	1	10½	10½	50/–	—	3 11	2
Edmundson's 7% Pref.	1	7	7	37/–	—	3 15	8
Elec. Dis. Yorkshire	1	9	9	51/–	—	3 10	7
Elec. Supply Corporation	1	11	11	58/9	—	3 14	10
Kensington Ordinary	1	7	7	36/–	—	3 17	9
Lancs Light and Power	1	7	7½	2	+6d.	3 15	0
London Electric	1	7	7	37/–	—	3 15	8
Metropolitan	1	10	10	56/–	+6d.	3 11	5
Midland Counties	1	7	7	40/–	—	3 10	0
Mid. Elec. Power	1	8	8	50/–	—	3 4	0
North Eastern Electric Ordinary	1	6	6	35/6	—	3 7	7
Do. 7% Pref.	1	7	7	35/6	—	3 19	0
Northampton	1	10	10	58/3	—	3 8	9
Notting Hill 6% Pref.	10	6	6	14¼	—	4 4	4
North Met. Elec. Ordinary	1	10	10	64/6	−6d.	3 2	0
Do. do. 6% Pref.	1	6	6	32/6	—	3 13	10
St. James' and Pall Mall	1	7	7½	38/–	—	3 19	0
Scottish Power	1	8	8	45/–	—	3 11	1
South London	1	7	7	36/–	—	3 17	9
Westminster Ordinary	1	7	7	36/6	—	3 16	9
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	28/3	+9d.	5 6	1
Yorkshire Elec.	1	8	8	49/–	—	3 5	4
PUBLIC BOARDS.							
Central Electricity, 1950–70	Stock	5	5	118	—	4 4	9
Do. 1955–75	,,	5	5	120	—	4 3	4
Do. 1951–73	,,	4½	4½	111	—	4 1	1
Do. 1963–93	,,	—	3½	103	—	3 8	0
London & Home Counties, 1955–75	,,	4½	4½	113	—	3 19	8
London Passenger Transport, A	,,	—	4½	128½	—	3 10	0
Do. do. B	,,	—	5	130½	—	3 16	6
Do. do. C	,,	—	3	92	−3	3 5	2
West Midlands Joint Elec. 1948–68	,,	—	5	118	—	4 4	9
TELEGRAPH AND TELEPHONE.							
American Tel. & Tel.	$100	9	9	108½	—	8 5	10
Anglo-Am. Tel. Pref.	Stock	6	6	124½	+½	4 16	5
Do. Def.	,,	1½	1½	30	—	5 0	0
Cables & Wireless 5½% Pref.	,,	2¾	2¾	84½	—	3 5	1
Do. A. 7½% Ord.	,,	Nil	Nil	19½	−⅛	—	
Do. B. Ord.	,,	Nil	Nil	6⅜	−⅜	—	
Globe Tel. and T. Ord.	10	Nil	2½	11½	—	2 3	5
Do. do. Pref.	10	6	6	13½	—	4 8	0
Great Northern Tel.	10	20	20	38½	+½	5 4	0
Marconi-Marine	1	10	7½	35/–	—	4 5	9
Oriental Telephone Ord.	1	12	12	3 1/16	—	*3 12	5
HOME AND FOREIGN TRAMS, ETC.							
Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/6	—	—	
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—	
Do. do. 5% Deb.	Stock	Nil	Nil	4	—	—	
British Electric Traction Df. Ord.	,,	5	5	980	+25	—	
Do. do. Pref. Ord.	,,	8	8	170½	—	4 14	0
Brazil Traction	100	—	—	9⅞	−⅛	—	
Brit. Columbia Elec. Rly. Pfce.	Stock	5	5	107½xd	—	4 13	0
Mexico Trams, 5% Bonds	—	5	5	19½	—	—	
Mexican Light Common	100	Nil	Nil	3½	—	—	
Do. 7% Pref.	100	7	7	4½	—	—	
Do. 1st Bonds	$500	5	5	50	—	—	
Victoria Falls Ord.	1	15	20	7 1/16	−1/16	2 13	9
Yorkshire (West Riding)	1	2½	5	28/3	—	3 10	9
MANUFACTURING COMPANIES.							
Aron Electricity Ord.	1	10	10	68/9	—	2 17	6
Assoc. Elec. Ord.	1	4	3	25/–	—	2 8	0
Do. Prf.	1	8	8	38/9	—	4 2	7
Babcock & Wilcox	1	9	6	48/3	−6d.	2 9	8
British Aluminium Ord.	1	5	5	32/3	—	3 2	1
British Insulated Ord.	1	5	15	78/9	—	3 16	2
Brush Ord.	Stock	Nil	Nil	42½	—	—	
Callender's	1	15	15	3 1/16	—	4 7	3
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0	0
Crompton Parkinson Ord.	5/–	22	12½	2	−1/–	1 11	3
Do. 8% Pref.	1	8	8	35/–	—	4 11	5
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6	4
Electric Construction	1	Nil	Nil	17/6	+1/16	—	
Enfield Cable Ord.	1	25	20	4 11/16	—	4 1	0
English Electric	1	Nil	Nil	7/6	—	—	
Do. do. Pref.	1	Nil	Nil	12/6	−9d.	—	
Ever Ready	5/–	35	35	22/6	+1/–	7 15	7
Ferranti Pref.	1	7	7	29/6	—	4 15	0
G.E.C. Pref.	1	6½	6½	33/9	—	3 17	0
Do. Ord.	1	8	8	49/6	+9d.	3 4	7
Henley's	1	30	30	?	+3/16	4 5	9
Do. 4½% Pref.	5	4½	4½	5⅞	—	3 16	8
India-Rubber Preferred	1	—	—	1½	+1/16	—	
Johnson & Phillips	1	5	5	29/6	−6d.	3 7	8
Siemens Ord.	1	6½	4	21/3	−1/16	3 15	4
Telegraph Construction	£1	Nil	Nil	1½	−1/16	—	

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parenthesis are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

9584. "Switch mechanism." Bendix Aviation Corporation. March 31st, 1932. (421908.)
16377. "Current transformers." International General Electric Co., Inc. June 7th, 1932. (422121.)
17960. "Filter for radio receivers." M. L. Lecompte. June 23rd, 1933. (422049.)
18423. "Locating of faults, more particularly in the insulators of high-tension aerial lines." General Electric Co., Ltd., and E. P. L. Westell. June 28th, 1933. (421824.)
18455. "Electric cells connected in a battery." Soc. Anon. le Carbone. July 2nd, 1932. (421891.)
18492. "Pressure-operated electric switch." S. Smith & Sons (Nottingham), Ltd., and A. G. Weller. June 29th, 1933. (421825.)
18531. "Synchronised-induction motor control." British Thomson-Houston Co., Ltd., and B. Adkins. June 29th, 1933. (421978.)
18689. "Electrical couplings of the plug-and-socket type." J. A. Crabtree. July 1st, 1933. (421892.)
18739. "Methods and means for making grids for thermionic valves and the like." British Thomson-Houston Co., Ltd. (General Electric Co.) July 1st, 1933. (421982.)
18766. "Electrical connections to the electrodes or terminals of luminous discharge tubes used in signs." W. E. Oughton, L. Hyman and B. E. Hyman. July 3rd, 1933. (422125.)
18912. "Electric wire conduits." Broughton Copper Co., Ltd., and F. Tomlinson. July 4th, 1933. (422055.)
18959. "Arrangements for controlling traffic signals." Automatic Electric Co., Ltd., and H. H. Harrison. July 4, 1933. (422056.)
18999. "Cathode-ray tubes." Telefunken Ges. für Drahtlose Telegraphie. July 4th, 1932. (422060.)
19236. "Keyboard controlled telegraph apparatus." Creed & Co., Ltd., and R. G. Griffith. July 7th, 1933. (422134.)
19341. "Lighting fittings and accessories." Otway-Breves, Ltd., and A. R. Otway-Cave. July 7th, 1933. (421832.)
19855. "Mercury-tube switches and relays." Siemens Bros. & Co., Ltd., and E. A. J. Bryan. July 13th, 1933. (421834.)
20663. "Television." Radioakt-Ges., D. S. Loewe and K. Schlesinger. July 23rd, 1932. (422064.)
20708. "Electric invertor systems." British Thomson-Houston Co., Ltd. July 22nd, 1932. (421990.)
21047. "Automatic control switches for electrically-driven compressors." W. Turner and G. Askew. July 26th, 1933. (421991.)
21483. "Variable electric inductances." General Electric Co., Ltd., and N. F. T. Saunders. July 31st, 1933. (421837.)
24235. "Electric annunciator or indicator system." Bryce, Ltd., and A. Colley. August 31st, 1933. (422071.)
24408. "Electric clocks." P. O. Dorer, September 2nd, 1933. (421910.)
24409. "Synchronous electric motors." F. Holden and Measurement, Ltd. September 2nd, 1933. (422072.)
25501. "Electric translating circuits utilising electric discharge devices." British Thomson-Houston Co., Ltd. September 14th, 1932. (422073.)
26850. "Electric-discharge lamps or tubes." A. S. Cossor, Ltd., and R. Pollock. September 29th, 1933. (422074.)
28053. "Overhead-current collector gear for electric vehicles." English Electric Co., Ltd., and P. L. Mardis. October 11th, 1933. (422006.)
28158. "Electric tumbler switches." H. L. Bentley and A. G. Ash. October 12th, 1933. (422007.)
29060. "Device for compensating the temperature error in induction meters." Landis & Gyr Akt-Ges. July 28th, 1933. (422077.)
29589. "Electric discharge devices." General Electric Co., Ltd., and R. Le Rossignol. October 25th, 1933. (421848.)
29872. "Electric couplings." Siemens Bros. & Co., Ltd., and C. Lambert. October 27th, 1933. (422008.)
30218. "Multiple-diode triodes." M. O. Valve Co., Ltd., and G. W. Warren. October 31st, 1933. (422079.)
30803. "Electric fuses." General Electric Co., Ltd., W. Wilson, and J. W. Gibson. November 6th, 1933. (421852.)
31752. "Electric discharge devices." M.-O. Valve Co., Ltd., and C. J. Smithells. November 14th, 1933. (421853.)
33313. "Submersible electric motors." F. Sigmund and J. Sigmund (trading as Sigmund Pumpen Bruder Sigmund), and M. Sigmund. November 28th, 1932. (421857.)
33515. "Arrangement of connections for the protection of electric transmission lines." Siemens & Halske Akt.-Ges. January 18th, 1933. (422012.)
33701. "Electrical instruments for measuring resistance." L. B. Turner. December 1st, 1933. (422013.)
34367. "Electric switches, particularly for lamp-holders." H. Garde. December 6th, 1933. (421859.)
34476. "Portable generators for use with radio-transmitting units." Soc. Anon. E. Marelli et Cie. December 9th, 1932. (421861.)

1934

49. "Toy electromotors." Trix, Ltd. January 16th, 1933. (421924.)
2198. "X-ray apparatus." C. H. F. Muller Akt.-Ges. January 24th, 1933. (422018.)
7930. "Manufacture of luminous electric discharge tubes." Claude-General Neon Lights, Ltd. April 8th, 1933. (421932.)
8569. "Tramcar." English Electric Co., Ltd., and T. P. Sykes. March 19th, 1934. (422091.)
9025. "Supports for adjustable sources of light or rays." C. H. F. Muller Akt.-Ges. March 23rd, 1933. (422023.)
10109. "Cathode-ray tube apparatus suitable for use in television and like transmitters." Marconi's Wireless Telegraph Co., Ltd. March 30th, 1933. (422158.)
10592. "Picture-assembling in television receivers." Sud-deutsche Telefon-Apparate-Kabel-und Drahtwerke Akt.-Ges. Tekade. November 6th, 1933. (421937.)
11113. "Thermostatically-controlled valves." A. R. Perkins, F. J. Grose, and S. Smith & Sons (Motor Accessories), Ltd. April 12th, 1934. (Divided application on 421900.) (421938.)
13426. "Radio and like receivers." Telefunken Ges. für Drahtlose Telegraphie. May 23rd, 1933. (422029.)
14930. "Searchlights." S. Grebel. May 17th, 1934. (422030.)
15996. "Anode protective tubes for electric-arc convertors." English Electric Co., Ltd. August 31st, 1933. (422166.)
18852. "Television." A. C. Cossor, Ltd. July 12th, 1933. (422034.)
20255. "Manufacture of electric lamps and luminous electric discharge tubes." General Electric Co., Ltd. July 28th, 1933. (421954.)
20258. "Manufacture of luminous electric discharge tubes and the like." General Electric Co., Ltd. January 3rd, 1934. (421955.)
20683. "Apparatus for the measurement of the power-factor in electric circuits." Landis & Gyr Akt.-Ges. August 31st, 1933. (422169.)
23365. "Synchronising systems for telegraph apparatus." Siemens & Halske Akt.-Ges. August 11th, 1933. (Cognate application 23366/34.) (421960.)
23534. "Electrical contact devices for use with sockets or holders for thermionic valves." Cinch Manufacturing Corporation. March 2nd, 1933. (Divided application on 6496/34.) (421961.)
24337. "Electric vacuum cleaners." British Thomson-Houston Co., Ltd. August 25th, 1933. (421884.)
27178. "Telephone systems." C. Lorenz Akt.-Ges. October 31st, 1933. (422042.)
28189. "Glass-bulb type mercury-arc convertors." English Electric Co., Ltd. October 27th, 1933. (422176.)
28190. "Tilting glass-bulb mercury-arc device." English Electric Co., Ltd. October 30th, 1933. (422113.)
24785. "Electric transformers." British Thomson-Houston Co., Ltd. August 29th, 1933. (422173.)
25278. "Cathode-ray tubes for television purposes." Radio-akt.-Ges. D. S. Loewe and K. Schlesinger. November 26th, 1932. (Addition to 9914/33.) (Divided application on 9914/33.) (422041.)

Versatile Colloidal Graphite

GRAPHITE is an allotropic form of carbon. It is electrically conductive and remarkably inert chemically. At ordinary temperatures it is not affected by acids, alkalies, or the halogens and it will not combine with oxygen until heated to 600° C., when it is converted into carbon dioxide.

Natural graphite, as mined, is intimately associated with foreign bodies, usually silicious. The pure product, frequently termed "artificial," is made in an electric furnace wherein impurities are removed by volatilisation. Colloidalisation has increased the utility of the material, which is prepared in several forms by Messrs. E. G. Acheson, Ltd., Thames House, Millbank, S.W.1.

For instance, "Varnodag" is a colloidal graphite in phenol-formaldehyde varnish which is used as a lubricating paint and for opaque blanking-out of neon signs. "Oildag" (10 per cent. in oil) is a lubricant employed for fire alarm parts, telephone equipment, radio components, and household devices. The versatility of "Aquadag" (18 per cent. in distilled water) results from its ability to form on solids an adsorbed film of graphite, almost molecular in thickness, which is tenacious, homogeneous and opaque, as well as being electrically conductive, photoelectrically poor, and chemically inert. In many instances it resists corrosion, oxidation and high temperatures.

"Aquadag" is used as a lubricant when oil is objectionable, such as for die-drawing tungsten and molybdenum, for die-casting machines, and also as a parting compound in moulding operations. It is employed as a resistance material for making radio tone and volume controls and grid leaks. When properly diluted its application to the grids of radio valves will retard secondary emission, and in a concentrated form it is a good clamping paste for carbon-filament lamps. Being a black body, this substance is helpful in thermopile design and it has other special applications.

A specific example of the utility of colloidal-graphited water is found in the manufacture of cathode-ray tubes, particularly those used as oscillographs for television reception. To assist in the focusing of the ray the interior surface of the glass tube is commonly coated with some conducting material. This layer acts as a second anode, but when composed of silver or some similar metal its lustrous surface impairs the brilliancy of the image by reflecting light.

Specially advantageous in this connection is the opaque and dark matt surface of a graphite film, which can be applied with equal ease to all types of glass without binding agents or prior treatment of the glass surface. The graphite film is sufficiently conductive by itself, has a low coefficient of expansion, will not easily oxidise, and acquires "getter" properties when baked.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Cinema, Union Street; T. Scott Sutherland, architect.

Alnwick.—Houses (80); M. T. Wilson, surveyor.

Ashby-de-la-Zouch.—Houses, Appleby Magna, electrical work; Goddard & Wain, architects, Station Chambers, High Street, Coalville.

Ashton-in-Makerfield.—Houses (36), Ashton Heath Road; U.D.C. surveyor.

Atherstone (WARWICKSHIRE).—Houses (52); surveyor, 102, Long Street.

Barnet.—Houses (50), Greenstreet Estate; R.D.C. surveyor. Cinema and shops at the corner of Shenley Road and Cardinal Avenue, Boreham Wood, for T. Hughes.

Barnsley.—Houses, Mount Vernon Road; borough surveyor.

Bedfordshire.—School, Dunstable, for County E.C.; Oswald P. Milne, architect, 64, Wigmore Street, London, W.1. Reconstruction of Bute Hospital, Luton (£85,000), for County P.A.C.; clerk, Bedford.

Bedworth (WARWICKSHIRE).—Houses (78), Collycroft Housing Estate (£25,000); J. U. Jones, Ltd., builders, Holmesdale Road, Coventry.

Bexhill-on-Sea.—Houses (20), Glenleigh Estate, Ringwood Road, &c.; Mr. Moore. Houses (29), London Road; borough engineer. Conversion of York Hall into cinema for Kinema Playhouses, Ltd.; Ward, Son & Wray.

Bilston (STAFFORDSHIRE).—Houses (20), Market Street; W. G. Lofthouse, architect, Town Hall.

Bingley.—Houses (200), Manor Park Estate, Cottingley; J. G. Jackson, builder, Roadside Works, Cottingley, Bingley.

Blairgowrie.—Houses (40), David Park; Grant & Henderson, Union Bank Buildings.

Bradford.—Houses (100), Reevey Road and Reevey Avenue; F. H. & F. Chippendale, L. W. H. Lewis and J. Needham.

Brighton.—Houses (354), Manor Farm Estate (£103,151); Wm. H. Green, Trafalgar Road, Portslade. Houses, Reigate Road; G. H. Pannett. Clinic, Sussex Street (£15,500); borough engineer. Shops, Rottingdean (£12,396); Building & Public Works Construction Co., Ltd.

Bromsgrove.—Houses (64); E. R. R. Tooby, builder, Stourbridge.

Burton-on-Trent.—Factory, Lichfield Road, Branston, for the Marley Tile Co.

Bury (LANCASHIRE).—Houses (1,500), Unsworth; A. Kershaw, builder, Chadderton. Town hall; borough surveyor.

Calne.—Houses (32); C. Syms & Sons, builders.

Cambridge.—Senior school (£35,320), for Borough E.C.; borough surveyor. R.C. schools, Union Road; Rev. Canon Marshall.

Cheshire.—Senior school, Bredbury, for County E.C.; director of education, Chester.

Chesterfield.—Municipal buildings, Rose Hill; town clerk.

Chester-le-Street.—Houses (150) for aged persons, and swimming baths, Birtley; R.D.C. surveyor.

Clacton-on-Sea.—Extensions to the District Hospital (electrical and heating work); E. R. Nixey, architect.

Coventry.—Houses, Radford area, and extensions to Frederick Bird School; city engineer.

Croydon.—Houses (43), Carmo Manor Estate, The Glade; Revell & Co., Ltd., Croydon. Houses (32), Gladeside and Fairhaven Avenues; West & Son, Croydon. Two schools, The Glade, Long Lane; borough engineer.

Cumnock.—Houses (20), Glaisnock Street; burgh surveyor.

Darlington.—Houses, Freemen's Place and Nickstream Lane; E. Minors, borough engineer.

Derbyshire.—Elementary school, Midway, Swadlincote; county architect.

Dingwall.—Houses (40); D. MacDonald, borough surveyor.

East Elloe (LINCOLNSHIRE).—Houses (48), Holbeach; G. A. Campion, builder, Peterborough.

Edmonton.—Houses, Cuckoo Hall Lane; U.D.C. surveyor.

Enfield.—Houses (28), Ordnance Road; C. V. Cable. Houses (86), Shaw Road, Carterhatch Road, &c.; Homemakers, Ltd. Cinema, &c., Southbury Road; G. Coles.

Epsom.—Houses (160) and shops, Chesterfield Park Estate; New Ideal Homesteads, Ltd. Houses (220), Northey's Estate, Cuddington; Morgan, Baines & Clarke, Wallington.

Folkestone.—Houses (71), Radnor Street and Hill Road; borough surveyor.

Girvan.—Houses (70), Bourtreehall site; burgh surveyor.

Glasgow.—Houses, Ardgay Street, Shettleston, Denmark Street and Panmure Street, also schools, East Keppoch, and Knightscliffe Avenue, Knightswood; city engineer. Houses (23), Mosspark; housing department, Trongate. Church, &c., Moss Road, Govan; Shieldhall & Drumoyne U.F. Church.

Grimsby.—Subway, Macaulay Street, Cromwell Road (£25,700); borough engineer.

Guildford.—Houses (200), Westborough Estate; borough surveyor. School, Grange Road; borough engineer.

Hertfordshire.—Schools, Manland, Harpenden, and Beaumont's Estate, St. Albans, and Underhill, Barnet, for County E.C.

Holmfirth (YORKS).—Houses (22); U.D.C. surveyor.

Hove (NEAR BRIGHTON).—Block of residential flats (£25,000); Harland and Parker, Ltd., builders, York Road, West Hartlepool.

Ilford.—Houses (28), Abbottswood Gardens; A. Smith & Son. Flats (78), Breamore Road; H. W. Binns. Church, Eastern Avenue; W. Harbrow, Ltd. Showrooms, High Street; A. W. G. Hudson. Additions to King George Hospital, Eastern Avenue; C. J. Dawson, Son & Allardyce.

Irish Free State.—(ROSCREA, CO. TIPPERARY).—Electric wiring work in connection with the meat factory, Roscrea, for the Roscrea Meat Co., Ltd.; McAteer & MacEntee, consulting engineers, Dawson Street, Dublin. (TUAM, CO. GALWAY).—Houses (90); J. P. Moran, engineer, Tuam.

Isleworth.—Factory, Syon Lane; Gillette Industries, Ltd.

Jarrow-on-Tyne.—Houses (160); borough engineer.

Jedburgh.—Houses (70), Headriggs; Jn. Innes, burgh surveyor, County Buildings.

Kingston-on-Thames. — Telephone exchange, Birkenhead Avenue, for H.M. Office of Works, King Charles Street, London, S.W.

Lancashire.—Extensions to Eccles Secondary Schools, for County E.C.; S. Wilkinson, county architect, Preston. Extensions to County Mental Hospital, Winwick (£50,000); Lancashire County Mental Hospitals Board.

Leicester.—Church, Chapel Lane, Knighton, near Leicester, for the Rev. Fr. Edwin Essex, P.P., The Holy Cross Priory, Wellington Street; F. J. Bradford, builder, Leamington Street. Completion of the Wiggeston Boys' School, including north-west block, &c. (£40,650); J. Miller, architects, 15, Blythswood Square, Glasgow, 2. Men's convalescent home, Charnwood Forest (£34,000); secretary, Leicester Royal Infirmary. New ward (200 beds), Isolation Hospital (£100,000); Health Committee.

Llanrwst.—Houses, Cae Person site; U.D.C. surveyor.

London.—(BERMONDSEY).—Factory, Grimscott Street; Crosse & Blackwell, Ltd. Flats, Leroy Street (£16,400), and Redriff Estate (£15,815); borough engineer. (CHELSEA).—Reconstruction to premises, Sloane Street, &c.; Slater & Moberley, on behalf of Peter Jones, Ltd. (E.C.1).—Extensions to nurses' home, operating theatre and cancer research department, &c., for the St. Mark's Hospital (£60,000). (N.W.).—Residential flats, St. John's Wood (£50,000); Harland & Parker, Ltd., builders, York Road, West Hartlepool. (ST. MARYLEBONE).—Baths, Seymour Place (£150,000); borough engineer. Flats, Albert Road and Culworth Street; Mitchell & Bridgewater. Flats, Wellington Road, Circus Road, &c.; Ward, Hoare & Wheeler. Rebuilding, 132-148, Edgware Road; Goldsmith & Osburn & F. J. Wills (STEPNEY).—Tenements (58), Medland Street (£25,800); L.C.C. architect.

Louth.—Houses (42), Brackenborough Road; borough surveyor.

Luton.—Houses (28), St. Winifred's Avenue, for A. G. Peck. Factory, Langley Road, for E. W. Hudson & Co.

Margate.—Houses (37), St. Peter's footpath; borough surveyor.

Middlesbrough.—Houses (22), West Lane; Kitching & Co., architects, 21, Albert Road.

Middlesex.—New Lady Eleanor Hollis Girls' Secondary School for County E.C. Public Assistance Officer, Glenhurst Road, Brentford (£20,000), and school, Manor House Estate, Alperton; county surveyor.

Newcastle-on-Tyne.—Houses, Ponteland Road, Kenton, for C.C.; city architect.

Newton-le-Willows.—Cinema, Victoria Road (£15,000); South Lancashire Hippodrome Co.

Northwich.—Houses (46), Danefield Estate; F. L. James, U.D.C. surveyor.

Nottinghamshire.—Central isolation hospital, Farnsfield (£135,000), for C.C.; clerk, Nottingham.

Oxford.—Schools, Florence Park, and Temple Cowley, for City E.C.

Ponders End (MIDDLESEX).—Factory and office, extensions, High Street and Southbury Road; A. J. Maxfield & Son.

Radcliffe.—Houses (200), Dumers Lane district; G. E. Wrigley, surveyor, Council Offices, Radcliffe, near Manchester.

Reading.—Senior elementary school, Whitley Estate, for E.C.

Shipley.—Houses (29), Stoney Bridge Road; M. Proctor.

Skegness.—Joint isolation hospital (£6,560); U.D.C. surveyor.

Slough.—Six factories; U.D.C. surveyor.

Smethwick.—Library, Thimblemill Road, two schools, Smethwick Hall House site, and extensions to Municipal College; borough engineer. Extensions to works, Hawthorns Street; United Spring Co., Ltd.

South Norwood.—Rebuilding of the Regent Cinema, Portland, Farley roads; E. S. Roberts, Birmingham.

Southampton.—New swimming pool, Corporation baths; borough surveyor.

Southgate.—Extension to Town Hall (£20,000); borough engineer. Development of Oak Lodge Estate; Oakwood Park Estates, Ltd.

Stockport.—Houses (180), Stockport Toad site, Cheadle Heath; W. F. Gardner, borough surveyor.

Stoke-on-Trent.—Houses (331), Burslem, Norton, and Goldenhill; borough surveyor.

Surrey.—Electric lighting for institutions, hospital, &c., for a year for C.C.; Dudley Aukland, clerk, Kingston-on-Thames.

Sutton Coldfield.—Houses (92), Antrobus Estate; Alec Coleman. Houses (18), The Boulevard; Davis & Son. Houses (126), Holland House Estate (£45,000), and two schools, Boldmere; borough engineer.

Tadcaster.—Houses (50), Kippax; R.D.C. surveyor.

Todmorden.—Houses (92), (£25,931); Walters & Westley, Ltd., Sheffield.

Torquay.—Senior school, Cricket Field Road, for Borough E.C.; director of education.

Tottenham.—Flats, &c., 648/654, Green Lanes; C. R. Symons & A. E. Harris. Factory, Garman Road; Commercial Structures, Ltd. Factories, Selby Road; D. J. Moss & Partners.

Tynemouth.—Shops, Chirton Green; F. R. N. Haswell & Son.

Walsall.—Houses (69), Fullbrook site; borough surveyor.

Watford.—Junior schools, Kingswood Estate, for Borough E.C.; director of education.

West Hartlepool.—Houses, Tips Estate; borough engineer.